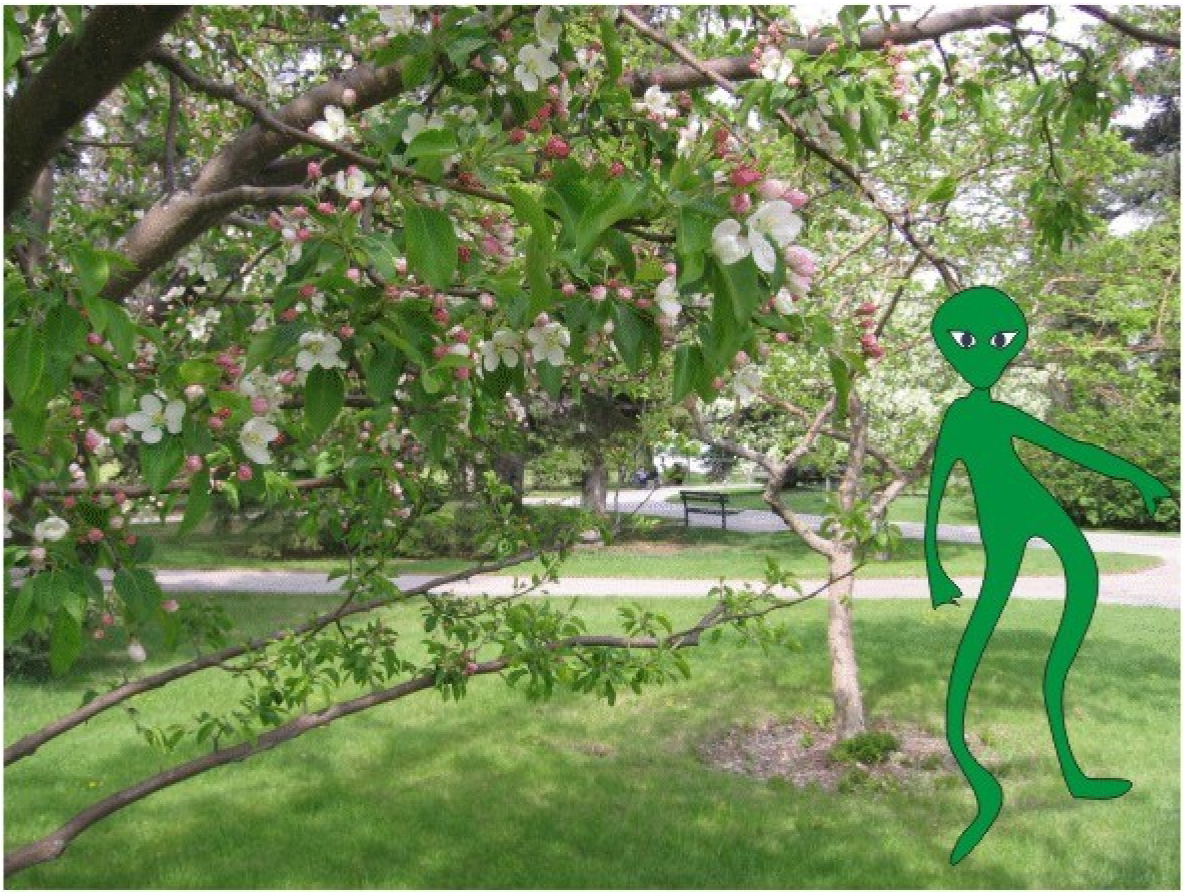
Hunting Green Aliens: The Epistemology of Investigation

Era: Circa 1992



Truth is correspondence to reality.

An investigation is a quest for truth.

When we make these statements, we assume two things: first that reality has an identity and second that that identity is knowable.

People hunting green aliens or truth can look more effectively if they know the Rules of the Quest.

So what are the rules? Let's consider some of them.

The Existential Positive

To state that something exists, is to imply that it exists in space and in time.

If I profess that something exists, and I want to be believed, it is my responsibility to prove the existence of the object. I can't dump the responsibility somewhere else by saying, "Prove that it doesn't exist."

Why?

Because I cannot in principle, prove that a non-existent doesn't exist. I cannot identify something which has no identity. This is a long-standing principle of science and is usually stated: "The onus of proof in on the existential positive."

The word existential is important. For example, no one can prove that a drug is safe. To state that a drug is safe is a positive statement, but not an existentially positive statement. Safety is an **absence** of danger.

You could do experiments from now until Mulroney gets re-elected and every one of them might fail to reveal harmful side effects. Still, these experiments do not establish the fact that the drug is safe. They only increase the probability that your perception of the safeness of the drug is realistic.

But someone can prove that a drug is NOT safe. They only have to present a single case: a person or animal that has died or suffered from using the drug. Just one person/animal is all it takes to establish the unsafeness of the drug. Unsafeness is the existential positive.

It's like looking for a green alien. You might not know the spot in the woods where the saucer is going to land. Even after thousands of hours of looking you can NOT prove that green aliens don't exist. You can only establish an increased probability that they don't exist. The onus of proof is on the existential positive. It takes the capture of one of the little fellows (or alternately, some pretty fool-proof evidence) to prove existence. But you only need to capture one. When you're dealing with the existential positive, one case proves your point.

Don't be surprised if you end up chasing a moving target though. Green aliens aren't that easy to find. When you consistently return from your searches with no proof, you are adding to the statistical database that supports the idea that green aliens do NOT exist.

It is perfectly reasonable for a person to assume that green aliens don't exist if they never see any evidence that they do. In fact it is far more reasonable for them to assume that they don't than that they do… which brings us to the subject of reasoning.

Deductive Reasoning

Deductive reasoning is based on the idea that if you have some definitions, some premises, and some rules of inference, you can derive all sorts of conclusions. For example:

Definition: Green Alien: a humanoid with green skin.

Premise 1: Some green aliens are less than two feet in height.

Premise 2: All creatures less than two feet in height have trouble manipulating the controls of a Lockheed P38.

Conclusion: Therefore, some green aliens have trouble manipulating the controls of a Lockheed P38

Premises and definitions such as the above can be combined into legitimate conclusions according to the rules of inference. Many of the rules are self-evident, some not so obvious. We use the rules all the time without recognizing that we are doing it.

It is worth discussing one logical error that most of us make frequently. That is – improper use of the contra-positive. Symbolically, the legitimate use of the contra-positive is to reverse and negate:

If p then q.

Becomes: If not q, then not p.

This is a legitimate logical transformation. The two statements are equivalent in content. The mistake we often make, is to reverse without negating.

To illustrate, let's use the expression, "No rest for the wicked." When someone says this to us, we often interpret the comment as: "If I don't get any rest, then I'm wicked," but this is not a legitimate conclusion and is an example of incorrect use of the contra-positive.

Usually stated: "No rest for the wicked."

Re-stated as a logical implication:

"If wicked, then not resting." If p then not q.

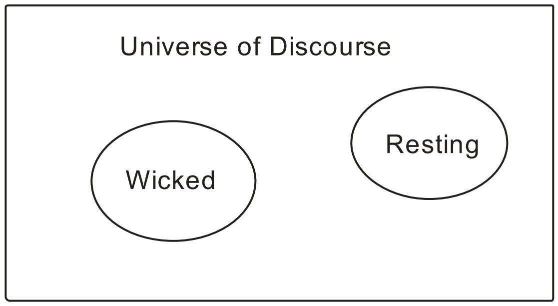
Contra- positive and correct logically: (reverse and negate)

If resting, then not wicked If q then not p.

Not logically correct: (reverse and don't negate)

If not resting, then wicked. If not q, then p.

This becomes more obvious if you look at the Venn Diagram for this case. The set of 'not wicked' is everyone outside the set of wicked (but still in the universe of discourse) and the set of 'not resting' is everyone outside the set of resting. Therefore, it is quite possible for you to be outside the set of resting people, but still not in the set of the wicked.



Finally, an important thing to note about deductive reasoning is that you need your starting premises before you can deduce anything. How do you arrive at the starting premises?

Inductive Reasoning

Universal premises (e.g. All flying saucers are white) are built through inductive reasoning.

Inductive reasoning is the process of inferring a general law or principle (i.e. a premise) from the observation of particular instances.

Some of the premises that result from this reasoning process are existentially positive, (e.g. Premise 1: “Some green aliens are less than two feet in height.)

The context of such a premise, (its location in space and time, etc.) is important. As soon as you change the context (universe of discourse) you could be changing the validity of your premise. e.g. The statement “living dinosaurs exist” was true 65,000,000 years ago but it’s not true today.

Given that the universe of discourse is important, we should consider restating Premise 1 as “During 1992 in the Milky Way galaxy, some green aliens are less than two feet in height.”

The history of science is riddled with problems relating to the universe of discourse. For example the Theory of Relativity didn’t invalidate Newtonian Mechanics. It provided a superset of principles that were operative for objects travelling at a high percentage of the speed of light. In other words, the Theory of Relativity dealt with a broader “universe of discourse”. It predicted results in a context where Newtonian Mechanics broke down. Today there are indications that the Theory of Relativity is no longer adequate in some instances. Perhaps, once again, we are pushing a theory beyond its legitimate universe of discourse.

Because the universe of discourse and the universe of experience are two different things, inductive reasoning often involves the use of an unproven jump. You have to depend on the statistics of your experience to arrive at many of the premises you use. In other words, you observe reality, then assume that any truth that holds in the universe of your experience, holds in some universe beyond your experience. The universe beyond your experience in which you assume the premise holds true, is the universe of discourse.

Note however, that the universe of discourse (discussion) doesn't have to be larger than the universe of your experience. It could be smaller, a subset or even contain exactly the same members.

A discrepancy between universes doesn't get you into trouble unless your universe of discourse contains members that aren't in your universe of experience. If this happens – and it often does – the words "all" or "no" could spell big trouble.

As an example, consider premise 2 above. All creatures less than two feet in height have trouble manipulating the controls of a Lockheed P38. If the universe of experience and the universe of discourse contain the same members then we can do an exhaustive study of all creatures less than two feet in height and there will be no doubt about the truth of the premise.

It's more likely, however that the members in our universe of discourse will not ALL be in our universe of experience, that we will be drawing conclusions about members that we haven't exhaustively examined.

Because the premise contains the word "all" it is supposed to be a universal truth. By implication:

If all creatures less than two feet in height have trouble manipulating the controls

then creatures less than two feet in height who have no trouble manipulating the controls do NOT exist

In other words, our existentially positive premise implies an existentially negative corollary that could be basted apart with one counter example. And this well might happen because our universe of experience does not match our universe of discourse.

To illustrate, it's distinctly possible that green aliens who practice telekinesis might exist in the Milky Way. They could manipulate the controls of the airplane without actually touching them. Yet we might never have experienced this type of green alien before we formulated the premise.

We run into a similar problem with existentially negative premises. For example, we might have said, "No green alien is over two feet in height." As indicated above, such a statement is universally true only if we have exhaustively examined every green alien in our universe of discourse and concluded that every last one is less than two feet. Such an examination is not possible if we're trying to apply our logic to the whole world or the whole solar system.

Thus if our universe of discourse contains members that are not in our universe of experience, we have to accept a potential inaccuracy of our premises.

But all this uncertainty has never stopped us. And there is nothing wrong with uncertainty, as long as we realize that it's there and recognize the weaknesses that it creates in our premises.

In spite of uncertainty, inductive reasoning is a valid process. Statistics are worth something.

Existence and the Law of Identity

Everything that exists has an identity. It has characteristics that make it the same as other objects and characteristics that make it different from other objects. Its identity can manifest itself in different ways, given different contexts. For example, water is a solid if its temperature is less than 0 Celsius and a liquid or a gas if its temperature is higher – assuming atmospheric pressure (note: universe of discourse.)

Because green aliens have an identity, (assuming they exist) we can state a premise such as No. 1 above: Some green aliens are less than two feet in height. The existence of an object goes hand in hand with its having an identity. Every object that exists has an identity. That's the way the universe is built and that's the fact that allows science to operate. Science is the process of discovering the identity of the universe and its parts.

The identity of the universe is totally independent of what you and I want that identity to be. We can not "think" green aliens into existence. Nor can anyone think them out of existence (unless of course, the aliens are an IDEA – which is a subject to be avoided for the time being).

A corollary of the law of identity is a requirement for non-contradiction. An object must be consistent with its own identity. An object cannot be a "green alien" and a "non-green alien" at the same time and in the same place. (Note: universe of discourse.) For example, a particular crop circle cannot be a human hoax if the area is inaccessible to human life before and during the time the circle is created. But the field must be truly inaccessible. To restate this, no crop circle can be hoaxed (accessible) and not hoaxed (inaccessible) at the same time. Reasoning that allows this type of inconsistent conclusion is faulty i.e. it doesn't map onto reality.

Formulating Hypotheses

We will call the person who professes the existence of an event, the profess-or. For the purposes of this discussion, we're talking about an existentially positive event.

Supposing the profess-or tells the investigator that he saw a green alien sitting on a toadstool at a particular spot in the woods yesterday at two o'clock.

Let's consider this problem.

If the phenomenon occurred in the professed location at exactly two o'clock, then there should be current signs of the event. Note the profess-or might have witnessed something aside from a green alien so we don't take him at his word.

Instead we collect as much evidence as we can and consider other possible explanations. This evidence would include:

a. Talking to witnesses

b. Collecting physical traces

c. Taking pictures of evidence that cannot be removed and protected

d. Other things.

Supposing when we talk to the profess-or, we find that he isn't really sure that he saw a green alien but he does assure us that he saw a flash of green just as he arrived at a particular toadstool in the woods. Right next to the toadstool, he found a pair of miniature trousers and a shirt.

All the while we are collecting our evidence we should be forming multiple hypotheses, searching for several that would explain the evidence. The key word here is multiple. Don't stop at one. Even outlandish hypotheses, like green aliens are acceptable.

For example, we might form the following list of possible hypotheses:

a. the pants and shirt were left by a green alien

b. the pants and shirt were left by a child who was playing with his/her doll

c. the pants and shirt were deposited by a dog that stole them from a child

d. someone tied the pants and shirt to a helium balloon and allowed them to float away. They landed in the woods at this particular spot.

e. a person stood a fair distance back in the grass and threw the garments onto the toadstool.

Ideally this list should contain all possible hypotheses. Unfortunately, it's difficult to prepare an exhaustive list. We might find that it's necessary to add items to the list as we continue our investigation. If we think of something that might explain the data, we should not ignore it. Ideally our list should contain every possibility.

Why? …Simply because we want our list of hypotheses to contain the correct one. If it does, we've reduced the problem to one of deductive reason (as opposed to inductive) and can isolate the correct one based on the differences between the hypotheses.

As we examine the evidence, we try to determine an experiment that would test the validity of each hypothesis, based on these differential characteristics. Before doing the experiment we consider what the results of the experiment might be. We determine how we would interpret these results.

Then we prepare the experiments and test each of the possibilities. For example:

Hypotheses ‘a’ and ‘b’ experiment: See if the ground around the toadstool is covered with tiny shoe prints.

Possible results: the existence of tiny shoe prints might increase the probability of the green alien or the child hypothesis. Lack of tiny foot prints does not necessarily disprove either hypothesis. Note, that a child and a two foot high alien would have feet about the same size. Therefore this experiment is not differential between hypotheses ‘a’ and ‘b’ but differentiates ‘a’ and ‘b’ from ’c’, ‘d’ and ‘e’.

Hypothesis ‘c’ experiment: see if the ground is covered with dog prints, if stalks of grass are broken in a path leading up to the toadstool, if the pattern of breakage is consistent with a dog’s gait.

Possible Results: if we see this type of breakage it indicates a high probability that the clothes were left by a dog. Nevertheless there are still unexplained phenomena. For example how do we account for the flash of green that the profess-or saw. Also we must be very careful that these are the prints of a dog as opposed to those of some other wild beast that might have deposited the outfit.

Etc.

When we finish our investigation, we summarize our results. We can do this according to the method outlined in the appendix.

The results that we obtain might only determine probabilities. We might find that none of our hypotheses is 100% probable. Our results might be totally bizarre and we might have to add more hypotheses to our list in order to explain what has happened.

This process of adding hypotheses, gathering evidence, eliminating hypotheses, should eventually spiral us toward a final conclusion.

Let’s consider for a moment the idea of eliminating hypotheses. If the presence of the evidence implies the negation of the hypothesis, then the hypothesis can be ruled out. For example, if radiation fields in the vicinity of a crop circle are high enough to immediately kill a human being, both before and during the creation of the circle, then it is possible to rule out the idea that the circle was created by a human. (Assuming of course, you don’t find a body in the field.)

Supposing we are, at least for the time being, satisfied with our results, we try to interpret them:

1. If all the hypotheses except one, lead to the conclusion that each of the individual hypotheses is impossible (except the one) then we should consider what Sherlock Holmes has to say:

> “When you have eliminated the impossible, whatever remains, however improbable, must be the truth.” Sir Arthur Conan Doyle, “The Sign of Four”, Chapter 6, 1890

Please note that "whatever remains" actually contains unstated hypotheses – the things you didn't think of – so you have to have an exhaustive list before this principle is a whole lot of use.

2. If one of our hypotheses explains all the evidence and the rest explain only part of it, then the hypothesis that explains the evidence is highly likely, but it is not proven until we have eliminated all other equally likely possibilities from an exhaustive list. The key word is exhaustive.

   In the real world, we seldom have an exhaustive list – even when we think we do. Uncertainty reigns supreme. Fortunately our brains are particularly adept at dealing with this type of problem. We operate on a statistical basis, recognizing patterns that repeat themselves and using the resulting probabilities so that we can act even if reality is uncertain. This is fortunate because a failure to act can mean the death of a living organism. It's essential that we recognize uncertainty and that we learn to deal with it.

3. If one of our hypotheses is a hundred per cent probable then our conclusion is self-evident… unless of course we have two hypotheses that are a hundred per cent probable and the two hypotheses exist only under contradictory circumstances… in which case we have a problem – the Law of Identity and all that.

   The times when our conclusions will be 100% probable are few and far between. We might achieve this level of probability if we work with an exhaustive list of hypotheses (i.e. if our universe of discourse matches our universe of experience) and if we examine every case in the universe.

   Alternately, we could have 100% probability if we deal with a tautology. For example we could say that crop circles are created by green aliens and then define a green alien as anything that creates a crop circle. Neat trick, hey?

4. Correlation doesn't imply causation. If two pieces of evidence consistently appear together we should recognize that one is not necessarily the cause of the other. (This is the old "smoking causes cancer" argument.) For example, if we find human footprints next to crop circles, we cannot assume without doubt (100% probability) that a human has created the crop circle. There are other possible interpretations:

   a. Both of the correlated events might have been caused by a third event. e.g. Ball lightning might have created the circle and attracted the attention of the human, drawing him to the location.

   b. The juxtaposition of the two events might be totally accidental e.g. the human might have been walking through the field when a vortex of air came long and created the circle.

   Nevertheless we should be recognizing probabilities and if footprints are found near crop circles, we should realize that it is possible and even, as the statistics continue to come in, highly probable that the circles are created by humans. Sometimes when events are correlated, one event is, in fact, the cause of the other.

5. If two hypotheses appear to be equally likely and neither leads us to conclude they are 100% probable, there is another commonly accepted scientific principle that is brought into effect. It is called Ockham's razor and allows us to break the tie and place a greater value on one of the two hypotheses.

Ockham's Razor

Ockham's Razor is the doctrine that unnecessary assumptions should be avoided when formulating hypotheses.

It is stated as: "Don't manufacture causes beyond necessity."

In other words, don't manufacture little green aliens to explain a problem unless you can't explain it with things that you know already exist.

To re-interpret 5 above, if we have two equally likely hypotheses and one requires that we hypothesize little green aliens while the other only requires the existence of a dog, then Ockham's Razor states that we should prioritize the hypothesis that requires the dog.

This is all well and good, providing we are dealing with a dog, but one can always ask, "What if the event really was caused by little green aliens?" This is a legitimate question. Ockham's Razor is a valuable principle when one is dealing with uncertainty but it can be used to eliminate the truth as well as find it, if applied too zealously.

The words, "beyond necessity" are important. If the dog hypothesis does not explain some of the evidence then maybe the investigator needs to introduce the alien hypothesis, in which case he is not manufacturing causes beyond necessity.

As a result of Ockham's Razor, an investigator must not only establish that his outlandish hypothesis has a high probability of being valid, but also that none of the more orthodox hypotheses will explain the evidence as well.

Skepticism

The Oxford English Dictionary defines a skeptic as (amongst other things) a seeker after truth; an enquirer who has not yet arrived at definite convictions. In this sense of the word, one can see why it is essential that a UFO investigator be a skeptic. An investigator cannot possibly formulate an exhaustive list of hypotheses without an attitude like the one defined by Oxford.

Unfortunately, there are people who appear to hold a different definition of the word skeptic. These people maintain that any intellectual position that does not fit within the current body of scientific knowledge does not correspond to reality.

There are traps in such a belief. Being a skeptic according to this definition can easily lead one to make up one's mind without examining the evidence, but so can a belief in flying saucers if the belief isn't rooted in real evidence.

On the other hand, such a skeptic never wasted his time looking for evidence that isn't there. A lot of fraud and deception goes on in the world. If you examine all the evidence relating to every area of enquiry, you can spend a lot of time chasing your tail, looking for evidence where there is none.

Whatever your definition, skepticism is healthy when it motivates a person to exercise critical judgment, unhealthy when it causes him to rely on the current body of knowledge without recognizing the body is incomplete.

Science is incomplete.

And in the end, reality will be the judge whether we like it or not.

Out in the Field

In summary, let's apply some of these ideas to the investigation of crop circles. These notes are not intended to be a complete analysis, but an opportunity to illustrate the previous ideas.

a. Hypotheses

1. hoax
2. alien craft footprint
3. meteorological explanations
4. animal or bird effects
5. seed spills
6. unknown

b. Basic Evidence - Existentially Positive

1. Crop circle, unusual structure

c. Differential Evidence to permit distinctions between likeliness of various hypotheses

1. Traces of human activity
    - access trail
    - witnesses
    - geometric control e.g. hole at center

2. Layering

3. Ground compression

- rocks sticking up
- density readings
- soil compaction

4. Correlative Evidence

- airborne lights
- animal unrest
- witnesses
- electronic failures

5. Similarities/differences with known phenomena

- seed spill characteristics
- crow circle characteristics
- weather circles (hail, vortex)

6. Microscopic evidence

- cell structure changes

d. Burden of Proof

1. Hoaxing requires positive evidence of human involvement.
2. Alien evidence requires positive evidence of alien involvement.

e. General Comments:

If the list of hypotheses is considered exhaustive, an absence of positive evidence for all hypotheses except hoaxing, implies that hoaxing is the best explanation.

The alien hypothesis would be most probable if:

1. contextual conditions would make access of a hoaxer impossible.
2. geometry of the circle is too precise to be crow or wind related.
3. positive evidence of heavy ground compression existed – rules out wind and crows, also supports 1 (above).

4. multiple credible witnesses saw the craft land and leave.
5. a craft was tracked at speeds well beyond our current technology.
6. etc.

If we had a circle with no evidence of hoaxing, but conditions existed which didn't rule out either hoaxing or vortex creation, Ockham's Razor would eliminate the alien explanation. Such will be the case until evidence from other phenomena establishes the existence of aliens at a level of probability that is comparable to the probability of hoaxing or wind vortices. Uncertainty is dealt with by probability.

For a more complete analysis of how to deal with multiple hypotheses, see the appendix for this piece (prepared by Dr. Al Herron).

The Rules of the Quest

So now we have it – onus of proof, deductive reason, inductive reasoning, existence, the Law of Identity, hypotheses, Ockham's Razor – all Rules of the Quest.

When we hunt for green aliens or try to figure out how a crop circle is created, we look for truth.

Most of us love working a puzzle – but, even more, we love solving it. So it's worth noting – in the quest for truth, the investigation is a lot more effective if we play by the rules – because the first person we fool when we don't, is ourselves.

Appendix: Comparison of Hypotheses and Experimental Results

The following is an example, in tabular format, of hypotheses verification/elimination using experimental evidence. The example is a long way from being rigorous, but shows how the essential ideas of the foregoing paper come into play in credible investigation.

Suppose we have four hypotheses - A, B, C, and D - from which we can predict the results of some or all of several experimental observations - 1, 2, 3, 4, and 5. For simplicity I shall assume that the experimental predictions and observations can assume one of three mutually exclusive values, as follows:

s   yields a specific, existentially positive result

-    irrelevant, indifferent, no prediction

x   yields a specific, existentially negative result

The predicted results of the five experiments, according to our four hypotheses, then can be represented in a table, as in Figure 1.

Consider the 's' in column B, row 3, for example. It means that hypothesis B predicts the result of experiment 3 will be the clear existence of something specific and observable; that the hypothesis cannot be true if actual observations of experiment 3 fail to yield the predicted, existentially positive, result.

	Hypotheses			
Experiment	A	B	C	D
1	s	x	-	s
2	-	-	s	x
3	x	s	s	x
4	x	-	x	-
5	s	-	-	-

Figure 1: Example Theoretical Predictions of Hypotheses A..D for Experiments 1..5

The actual observations may be summarized as shown, for our example, in Figure 2. Note that '-' is not reasonable here... an observation which has no definitive result is useless.

Experiment	1	2	3	4	5
Observed value	s	x	x	x	s

Figure 2: Example of Observed Values for Experiments 1..5

At this point we must compare the predicted results of the experiments with those actually observed. The results of particular comparisons yield 'truth values' for the various hypotheses wherein the universe of discourse is the single experiment in question. In our example I shall assume that there are 3 possible truth values, viz:

T positively verified, theory and observation agree

P possible, neither positively verified nor rejected

F positively rejected, theory and observation disagree

Comparison of theoretical prediction and observation would yield the truth values shown in Figure 3. Note that an F results if, and only if, theory and observation positively disagree...at least one of them has to be an existentially positive statement before a definitive, absolutely certain, rejection is possible.

Theory	s	s	-	-	x	x
Observation	s	x	s	x	s	x
Truth Value	T	F	P	P	F	T

Figure 3: Truth Values for Comparison of Theory and Observation

Comparing the theoretical results of Figure 1 with the observed results of Figure 2, using Figure 3 to obtain the truth values, gives Figure 4. The 'F' in column B, row 3 of Figure 4, for example, was derived by comparing the 's' in column B, row 3 of Figure 1 (theory) against the 'x' in column 3 of Figure 2 (observation) to get 'F' from Figure 3.

	Hypotheses			
Experiment	A	B	C	D
1	T	F	P	T
2	P	P	F	T
3	T	F	F	T
4	T	P	T	P
5	T	P	P	P

Figure 4: Example Truth Values for Hypotheses A..D Under Experiments 1..5

We now expand the universe of discourse to include all 5 experiments, using the following rules:

Any hypothesis which contains an F in its column must be rejected, because it positively contradicts experimental results. If every hypothesis contains an F the set of hypotheses must be incomplete. In Figure 4 we reject hypotheses (columns) B and C.

A positive verification should give us more confidence in the hypothesis than an experiment to which the theory is indifferent. Therefore we should place more confidence in those viable hypotheses which contain a larger proportion of T's. We thus prefer theory A to D in Figure 4, but do not consider D as rejected. Had A and D both contained the same number of T's we would use Ockham's Razor to prefer one over the other until further evidence becomes available.

The results to this point indicate that we want evidence which would clearly reject A or D, or both. And, since we already know B and C are not viable, we know that new experiments which have the sole effect of determining the viability of B or C would be a waste of time and effort.

We thus have a guide for identifying new experiments and assessing their value. Note, however, that this conclusion assumes the set of hypotheses is exhaustive; that our universe of discourse already includes the true hypothesis. If the set of hypotheses is expanded then other experiments, perhaps indifferent to the present theories, may well be relevant and valuable.

The more different experiments we can do which differentiate between competing hypotheses the higher our confidence becomes in any theory which remains viable. We never become absolutely certain of truth, but we approach that situation 'asymptotically'.

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