CHAPTER 6

Types of Explanatory Mechanisms

I. Explanation Via Confusion, Emotion, Empathy, or: "Rhetorical"

A. Frances Bacon's origins of erroneous reasoning
   1. idols of the tribe
   2. idols of the cave
   3. idols of the market place
   4. idols of the theater

B. Charles Pierce's rationales for erroneous reasoning
   1. tenacity / novelty
   2. authority / antiestablishment
   3. subjectivism
   4. intuition / a priori
   5. rationalism / a priori

C. Informal fallacies
   1. argumentum ad baculum
   2. argumentum ad hominem
   3. argumentum ad ignorantiam
   4. argumentum ad misericordiam
   5. argumentum ad populum
   6. argumentum ad verecundiam
   7. false cause
   8. complex question
   9. ignoratio elenchi
   10. petitio principii
   11. equivocation
   12. amphiboly
   13. accent
   14. composition
   15. converse accident
   16. division
   17. accident

D. Lies
   1. adding information which is not factual (lie of commission)
   2. removing information which is of importance (lie of omission)

E. Conceptual follow-up: believability and the simple exposure effect

II. Explanation Via Specification of Future Causation or: "Teleological"

A With intentionality
B. Without intentionality

III. Explanation Via Appeal to Inner Cause, or: "Reductionistic"

A. Empirical
B. Nonempirical
   1. with basis in folklore
   2. with substantial converging support
C. Flaw of reductionism as psychological explanation
   1. the fallacy of unobserved verbal activity as a cause of behavior
      a. it is not logical
         i. when internal is not tied to external
         ii. when internal is tied to external
      b. it is not reliable
      c. it is inconsistent with evolution
      d. it is inconsistent with empirical findings
         i. phobia can be desensitized without verbal
         ii. blind sight
         iii. split brain research contradicts it
         iv. extinction is slow
         v. self-destructive behavior exists
         vi. inconsistent with physiology

IV. Explanation Via Specification of Functional Relationships, or: "Correlative"

A. Temporal context
   1. historical (time scale of adaptation)
   2. current
   3. potential or functional
B. Assembly level of explanatory unit
   1. molecular
   2. molar
C. End state, functional, or teleonomic description
D. Conceptual follow-up
   1. reductionistic versus correlative (behavioral) explanations
   2. mentalistic versus correlative (behavioral) explanations

CHAPTER 6

Types of Explanatory Mechanisms

I. Explanation Via Confusion, Emotion, Empathy, or: "Rhetorical"

Rhetorical explanations are not really explanations at all and are therefore unacceptable even though they can be made to appear correct by fiction writers or our own confusion. They are nonempirical verbal statements chosen to produce agreement not explanation. For example, "we should not give these people fair trials because they killed my friends" (the reason causes empathy for the view); "evolution is false because humans are debased by a view which suggests that they evolved" (an invalid emotional argument); "things fall because of gravity" (a tautology empty of any meaning). I saw a movie that made me realize it was true (believing that fiction is true). These "explanations" are actually nothing more than verbal confusion.

This is not to say that all information or knowledge gained through rhetorical explanations is wrong. Some things are facts. It is a fact that you will burn your hand if you put it on a hot stove. It is a belief based in rhetoric however if you believe it simply because of the person telling you rather than because of its factual basis. The examples provided for each of the following instances are obvious errors so that the flaw in the reasoning can be better illustrated.

A. Frances Bacon's Origins of Erroneous Reasoning

Frances Bacon described four types of illusions or types of threats to critical thinking. His categories were based on how a person came to think that way.

1. Idols of the Tribe

These are errors in correct reasoning attributable to the phylogenic and ontogenic experiences common to all humans: what he labeled human nature. The implication was that they are an intrinsic part of what it is to be human and are inborn characteristics of the functioning of the human brain. Examples of what Bacon intended by this category would be that most people have a great deal of difficulty with quantum mechanics. At the quantum level something can move from Point A to Point B without passing through any of the intervening space. Because humans have commerce only with levels of reality where thing

pass through all intervening locations, quantum logic is very alien and seemingly ridiculous. A second example would be the strong tendency for humans to attribute to others and to lower animals their own personal motivation (anthropomorphism).

2. Idols of the Cave

These are errors in correct reasoning attributable to an individual's ontogenic experience: what he labeled peculiar and singular disposition. These errors are other than those covered by the following two idols. A person tends to only know subjective images, and is thereby limited. The label for this category is by analogy to Plato's shadows on a cave wall. An example would be a very selfish person may interpret everyone's motives as selfish.

3. Idols of the Market Place

These are errors in correct reasoning attributable to a person's social relationships, especially the nature of language. For example, the English language has many referents to mental causation which vary from nouns to the very structure of sentences. As a result, mentalism is very typical of people speaking English.

4. Idols of the Theater

These are errors in correct reasoning attributable to the errors in that person's paradigm. These include tradition and religion. An example of this type of error would be to believe that Johnny is misbehaving because he has id/ego conflict. The various nonfunctional fads in education are reflections of public policy being driven by errors caused by idols of the theater.

B. Charles Pierce's Rationales for Erroneous Reasoning

The following were labeled by Charles Sanders Pierce as methods of fixing beliefs.

1. Tenacity / Novelty

Belief or faith based on what was done in the past (tradition) in lieu of logic, understanding, or explanation. Note that the position believed on the basis of tradition is not necessarily wrong. Belief in what was, is labeled belief via tenacity. An equally erroneous view is that whatever is new or nontraditional is correct.

2. Authority / Antiestablishment

Unquestioning belief or faith in authority in lieu of logic, understanding, or explanation. Belief in what you are told simply on the basis of the speaker's credentials is labeled belief via authority. Again, an equally erroneous view is that the "establishment" position is always wrong.

3. Subjectivism

Belief or faith in knowledge derived from feeling states in lieu of logic, understanding, or explanation. "I feel in my bones that this is true." Clinical or theoretical judgments are often justified with this excuse. It is essential to realize that you would not want to go to jail because El Excellente felt you were guilty. Belief in what you feel is right is labeled belief via subjectivism. Nurse Ratched was wrong because she believed her feelings were adequate justification for what she did to her patients. If a mob lynches someone they are guilty of murder not because the person being lynched is always innocent but rather the mob terminated a life for an unacceptable reason: their strong feelings that they were right.

4. Intuition / A Priori

Belief or faith in knowledge apprehended directly without experience or reason in lieu of logic, understanding, or explanation. "I know that this is true." Belief in what you know is right is labeled belief via intuition or via a priori knowledge. It differs from subjectivism in that there is no emotional basis for the belief, it is simply "known." It differs from rationalism in that it was not "reasoned out."

5. Rationalism / A Priori

Belief or faith in knowledge acquired through reasoning process alone in lieu of logic, understanding, or explanation. "I reasoned this out so it must be true." Often people make erroneous but seemingly logical predictions because they misunderstand what is happening or are unaware of all the facts. Belief in what you have reasoned out is labeled belief via rationalism. We each know some brilliant rationalist such as Johnny Cochran or William F. Buckley, Jr. They could convince most people that night is day. Good salesmen are good at plausible arguments which are not true. The problem with rationalism is easily understood when you recall the time you talked someone into believing a lie by using what the other person thought was inescapable logic. Unfortunately, some people who claim to be scientists are more into winning than understanding truth.

C. Informal Fallacies

The following provides a list of erroneous logic whereby conclusions can be made to appear correct. They are also labeled informal fallacies, by Irving Copi.

1. Argumentum ad Baculum

A fallacy caused by an appeal to force (e.g., vote this way or I will fire you).

2. Argumentum ad Hominem

A fallacy caused by an appeal to an attack against the person by noting some negative but irrelevant aspect of the person (e.g., the statement he made is false because he is a terrorist).

3. Argumentum ad Ignorantiam

A fallacy caused by an appeal to ignorance or a lack of information (e.g., no one ever disproved the Bermuda Triangle, so we can assume that they are real effects).

4. Argumentum ad Misericordiam

A fallacy caused by an appeal to pity (e.g., you must give my clients money otherwise they will be poor and hungry).

5. Argumentum ad Populum

A fallacy caused by an emotional appeal to crowd think, to popularity, or the majority opinion (e.g., the majority of people in Mississippi don't believe in evolution so it must be false).

6. Argumentum ad Verecundiam

A fallacy caused by an appeal to an authority whose expertise is in some other area (e.g., you should vote this way because Tom Cruise votes this way).

7. False Cause

A fallacy caused by mistaking what goes before something, for its cause; this is formally labeled a post hoc ergo propter hoc error (e.g., last night was a full moon and crime was up therefore the moon must have caused it).

8. Complex Question

A fallacy caused by several conflicting questions rolled into one thus preventing a simple single "yes" or "no" answer (e.g., have you stopped beating your wife?).

9. Ignoratio Elenchi

A fallacy caused by drawing an irrelevant conclusion (e.g., murder is a horrible crime, therefore, the defendant is guilty).

10. Petitio Principii

A fallacy caused by arguing for a conclusion with nothing more than a synonym for the conclusion. It is also called begging the question (e.g., God is perfect and wrote the Bible because the Bible says so, and because the Bible was written by God, then it must be true).

11. Equivocation

A fallacy caused by confusing the different meanings a word or phrase may have (e.g., the sign said fine for parking, so I parked there).

12. Amphiboly

A fallacy caused by the ambiguity resulting from the grammatical construction permitting two different meanings (e.g., if you get Sue to work for you, you will be lucky).

13. Accent

A fallacy caused by changed accent changing the meaning of a statement (e.g., we should not SPEAK ill of our friends).

14. Composition

A fallacy caused by extending what is true for each individual of a set to the set as a whole (e.g., each member of a team is the best at that position, therefore, the team will win the championship).

15. Converse Accident

A fallacy caused by presuming that what is true of a special case is true in the general case. This includes basing a decision on too small a sample (e.g., because the person with a death in the family didn't have to take the test, none of us

should have to take the test). This fallacy is different than "composition" because in converse accident, we go from a special case to the whole rather than from one individual (which is just like every other individual) to the whole.

16. Division

A fallacy caused by extending what is true for a whole to each of its parts (e.g., the team won the championship so the first baseman for that team must be the best first baseman).

17. Accident

A fallacy caused by applying a general rule when an exception to the rule should apply. It is presuming a qualified general statement is applicable in all circumstance without restriction (e.g., thou shall not kill, therefore I must not swat a fly). This fallacy is different than division because in accident it is the application of a statement of a special case to the whole group.

D. Lies

There are also instances where the speaker deliberately makes statements that are known not to be true.

1. Adding Information which is not Factual (lie of commission)

An error caused by stating something that is not true (e.g., John robbed the store).

2. Removing Information which is of Importance (lie of omission)

An error caused by stating something that omits something essential for its correct interpretation (e.g., "John was a hard worker" – he also embezzled money).

E. Conceptual Follow-Up: Believability and the Simple Exposure Effect

Rhetorical explanations seem familiar and true because television programs all too often emphasize these rhetorical forms of knowledge. To make matter worse, the writer sets it up so that these types of reasoning usually win. This fantasy is necessary in television land because a generally uneducated audience cannot follow any other type of logic. The majority of viewers often do not have a very large or well-integrated paradigm nor are they trained in critical thinking. It requires considerable effort to learn about a wide variety of phenomena, check the explanations for each, and integrate them into a coherent paradigm. That

single task requires at least this entire text. It is much easier to make up isolated, illusory explanations for each event, even though accepting isolated illusory explanations is what it is to be ignorant.

An often unrecognized but serious problem develops when normally intelligent people are impressed over and over again, year after year, by simple common sense being correct in the make-believe TV world (simple exposure effect). People start using those rationales in their everyday interactions without realizing that they have used the erroneous, make-believe TV fantasy as their role model.

Imagine yourself being subjected to a decision you really don't like (hang by the neck until dead) based on any one of these rhetorical types of logic. The Quincy or Hawkeye characters on television, with their error prone rationales, would not be admirable if the consequences for their logic was more like what would happen in real life.

Even though most people would argue that they do not believe that television could have such a strong effect, it is relatively easy to reveal that they actually do accept the power of the simple exposure effect of television with a simple thought experiment. Consider a number of children's shows which encourage children to ignore hard-won wisdom (e.g., don't take rides with strangers) and at the end of the show the kid is right and the parents are wrong and all of society is happy that the kid did exactly what wisdom would have rejected. We would not like shows like this on TV because they would provide very bad role models. We would think that they would subliminally teach people to do what is harmful. Quincy and Hawkeye get to do things that virtually never work in real life and at the end of the show the writer makes everybody glad they did. The next time you watch either show, "identify" with some character other than Quincy or Hawkeye, or think about what would happen if they were wrong and your life or your career were at stake.

II. Explanation Via Specification of Future Causation or: "Teleological"

This type of explanation posits a cause in the future, but nothing can ever read the future, so it is clearly wrong. The future does not exist in the present. Things cannot reach out of the future to cause things to happen in the present. Only by the twisting of a metaphor or in a simplistic shorthand can organisms work for a future goal. A pigeon cannot be placed on an FR 100 schedule and be expected to behave appropriately the first time. A teleological explanation is a shortcut description of what is actually the result of a history of exposure to the ontogenetic and phylogenetic contingencies. In this sense a teleological

explanation is “backwards talk.” What appears to be a common trend in a history of functional relationships becomes a future state and subsequently becomes a future goal and eventually a future cause. Note that teleonomic (covered in Section IV. C. of this chapter) should not be confused with teleological. Teleonomic categorization does not imply causation in the future.

A. With Intentionality

These explanations assume an entity which is aware of the future contingencies and acts so as to benefit from that contingency. These explanations are therefore unacceptable for two reasons. First, nothing can read the future, the future simply does not exist in the present. Secondly, it's silly to explain why a person or pigeon does something by postulating a little man inside that does it. Even if that were the case, we should then be studying the little man inside. The task would be then to try to find the littler man within the little man, and so on in an infinite regress.

The fallacy of an internal agency intentionally trying to accomplish a future goal is easy to demonstrate by showing that the cause was actually in the past or by showing that the solution is suboptimal. For example, if you put a naive pigeon into a chamber with an FR 500 schedule running, it will starve to death before pecking the key 500 times for the future goal. Secondly, if while a goose is retrieving an egg into the nest, the egg is removed, the goose will continue retrieving the nonexistent egg “in order to return the egg to the next.”

The problem with teleological explanations is that they assume that the organism has some divine power to see into the future. Past experience with the phylogenetic or ontogenetic contingency must be at the root of the behavior.

It could also be said that mother nature designed the shark so it could swim through the water better (outside agent that knows what would be good in the future). The problem here is the assumption of an outside agency which can read the future, and then chooses to optimize the shark, and then carries out that desire.

B. Without Intentionality

This implies the speaker has absolute knowledge of the state of "perfection." The speaker extrapolates the presumed goal from the existing data, then states that the activity is directed toward that goal or is caused by that goal. To demonstrate the weakness of this class of intuitively compelling explanations it is only necessary to demonstrate some of these types of explanations that are silly in light of the now understood actual determinants of the behavior.

For example, a hen does not sit on eggs in order to keep them warm because it can be shown that she sits on eggs depending on her own temperature not the temperature necessary to protect the eggs. Snails are not moving around to find the best leaves. It has been now shown that they move around depending on

which way their shell is pulled.

These are clear examples that an extrapolated cause or teleological cause for the behavior could be totally wrong, and would lead us to make erroneous predictions, and erroneous theories. It is not a good idea to have a theoretical approach that is so susceptible to devastating error.

III. Explanation Via Appeal to Inner Cause, or: "Reductionistic"

These explanations are based on an internal, more "fundamental" or elemental process, or invoke additional more primitive elements to accomplish their explanatory power. These types of explanations have been very fruitful in medicine. However, they have had notoriously bad track records in psychology. Reductionistic explanations are sometimes also labeled "analytical" ("of what is the thing composed") or "mechanistic" (by what reductionistic mechanism is the process accomplished).

The issue raised by behaviorists is not that there are no processes operating at a more reduced level, nor that only correlative explanations are ever acceptable for any conceivable purpose. The issue is not whether you have what you point to when you say "consciousness," but whether it is productive to say that the reason you went to the store is that you "wanted to."

Reductionistic explanations have three important faults. First, they divert attention from the independent and dependent variables of psychology. Second, reductionistic entities cannot be useful if they have not yet been anchored to environmental inputs and outputs (i.e., a well-developed correlative explanation comes first). Finally, correlative explanations are typically the most productive path to a solution for an applied problem.

A. Empirical

This is physical reductionism. The classic example is a physiological explanation for behavior. For example, "the behavior occurred because of activity in the brain." It is important to keep in mind that: 1) a reference to the brain does not necessarily make something true. An empirical reductionistic explanation must show empirical evidence that that entity actually does cause the behavior. And, 2) the question remains – what caused the brain to do those things that caused the behavior? Few investigators would suggest that the brain has no role whatsoever in the behavior of the organism. An empirical reductionistic explanation must add substance and understanding to what everyone already accepts.

B. Nonempirical

This is nonphysical reductionism or conceptual reductionism. This category includes any reductionistic entity without actual empirical support such as the mind (including nonempirical physiologizing). Ultimately this approach can be seen as tautological. (Cause and effect are both the same single observation).

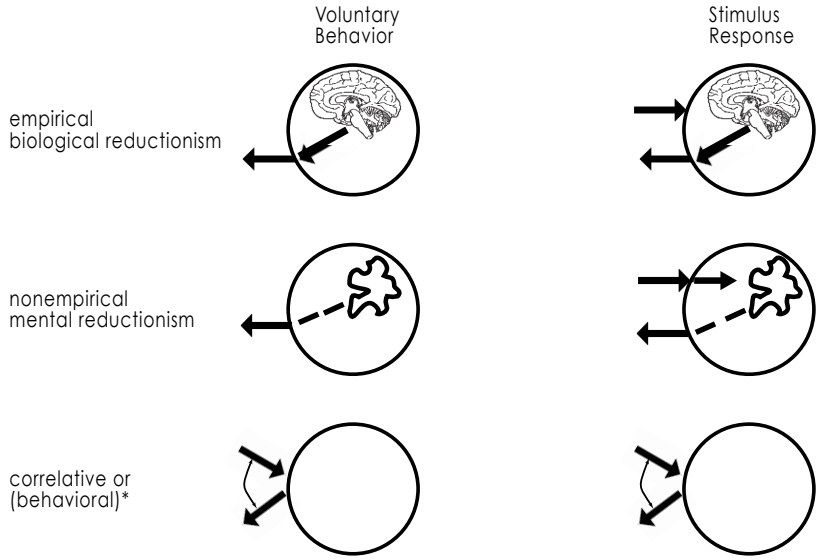
1. With Basis in Folklore

Unsupported phenomenological notions such as the mind are typical of this category. Spence referred to this class of explanation as animistic. These explanations are unacceptable because they have only flimsy support. Their support rests mainly in folklore and provide no hard evidence for the belief. For example, "when his mind realized the solution, John made the correct response" (often shortened to "when John realized the solution he made the correct response"). We of course know he realized the solution because he made the correct response.

2. With Substantial Converging Support

This category has what Dewey referred to as warranted assertability. A presumed reductionistic process generated from theoretical perspectives however is not necessarily always on firmer ground than primitive notions of the mind. Nonempirical entities which do not allow us to resolve disagreements other than by authority or opinion are not in the realm of science but rather are dogma.

A clear illustration of a reductionistic approach is provided by the notion of “rule-governed behavior,” as opposed to “rule-describable behavior.” The former implies a reductionistic entity which is using those rules to decide what behavior to emit. This type of reductionism is labeled Cognitive Psychology. The obvious question becomes how does the entity which is using the rules work? This issue is returned to in Section IV. D. of this chapter under correlative explanations. The following figure contrasts reductionistic frameworks.

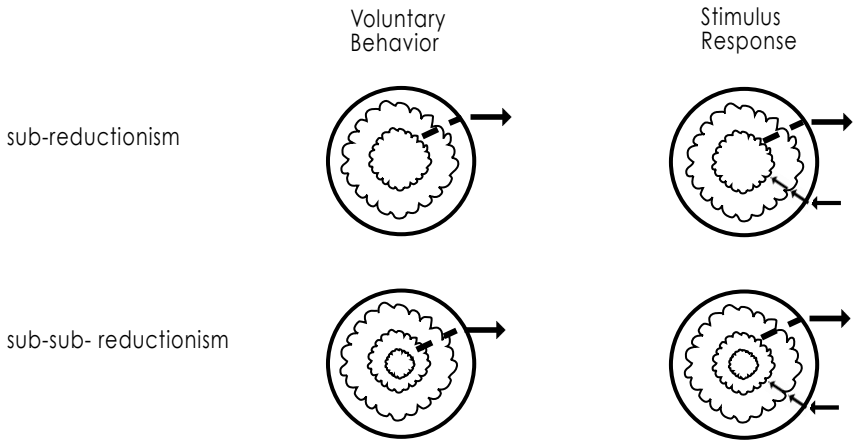


*A correlative view is not reductionistic and is included only for comparison.

C. Flaw of Reductionism as Psychological Explanation

We would immediately understand the fundamental problem with the reductionistic stimulus-process-response approach if the example were perceptual. For example, if I show you a red card and you say red - I could argue that in your brain you actually see green and that you just learned to say red when you see green in your mind. We could argue the point forever. In actuality, the issue cannot be resolved because there is no empirical anchor that can be used to prove one view or the other. Concern for what takes place in the mind is, therefore, a metaphysical question not a scientific one. The relevant facts are presenting colored cards and documenting the answers. Similarly, there are reinforcement contingencies in the environment and organisms exposed to them behave. The practical implication is if someone has a behavioral problem - how do we fix it? We change the environment, not reconnect the neurons in the brain.

An additional fundamental problem with a belief in the usefulness of reductionistic explanations is that they are arbitrary in two ways. If a mechanism operating at a lower more fundamental level is always better, then obviously a process more fundamental than the brain, the mind, or the mental processing center must be sought. We would be obligated to explain things chemically or with a subcognitive processing center, but then we would be obligated to explain things with quantum physics and a sub-subcognitive processing center. If one cannot accept a simple input/output (correlative) answer at some level, then one must go all the way to the bottom. If you cannot go all the way to the bottom, the stopping point is a matter of personal bias not epistemological validity.



Note in the above figure that the maximally reduced entity is typically postulated to work solely in terms of inputs and outputs, which is exactly what (as we will subsequently see) a correlative view of the entire organism has argued all along (note that the lowest level used in each figure are inputs and outputs with no reductionistic machinery). In this sense reductionistic explanations simply pass the problem to some other level. After all is said and done, all theories do nothing more than account for the relationship between inputs and outputs; arguing that a behavior is caused by some reductionistic internal process is simply obfuscating what is at the bottom a correlative explanation anyway.

The second problem with reductionistic causation is that it leaves open the question of what caused the brain process or mental process that resulted in the behavior. If the explanation for a pigeon pecking a green light is that the brain made it do it or that the mind made it do it, then the obvious question is what made the brain or mind do what they did? Typically, the answer would be the bird's reinforcement history. That is the answer given by a correlative explanation in the first place.

1. The Fallacy of Unobserved Verbal Activity as a Cause of Behavior

(This issue is discussed more fully in Donahoe and Palmer (1994)). It could be believed that some cognitive verbal process is the root cause of our behavior. For example, we could claim that a person thinks something through, arrives at a decision, and then behaves.

a. It is Not Logical

i. When Internal is Not Tied to External

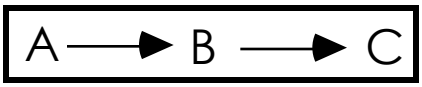
A precursor of any ability to use knowledge is that knowledge itself. Knowledge is "knowing" that A goes with B, such as "if more A, then more B." In

the absence of an explicit A, there can be no prediction of B. In the absence of A, we have only one hand clapping. If the unobserved verbal activity which is thought to cause behavior is not tied in a one-to-one manner with events in the environment, then that unobserved verbal activity cannot be precisely known. If it is unknown, then we have nothing with which to predict the output behavior. A position which would assert that output behavior is controlled by unobserved verbal activity which is not under the control of the environment abandons the opportunity to develop accountable predictive models.

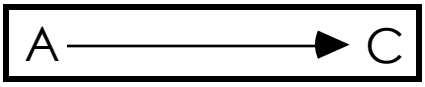
ii. When Internal is Tied to External

If the unobserved verbal activity which is thought to control the output behavior is under the control of environmental input, then the internal verbal activity becomes an irrelevancy in prediction.

If:



Then, a more parsimonious and more productive model is:



b. It is Not Reliable

Typically, when research has specifically examined peoples' verbal processes with respect to what they do, feel, or say, the findings have been consistent with that particular lab's theoretical assumptions but not consistent with other assumptions of other labs. Introspection failed one of the basic requirements of science, that of reliability.

c. It is Inconsistent with Evolution

Brain structures mediating verbal behavior developed very much later than much of the brain. The ability to behave evolved well before the ability to talk. Additionally, based on the anatomical evidence, it is unlikely that verbal behavior centers of the brain are in touch with older centers. There are too few neural tracks connecting those areas. As a result, it is reasonable to assume that verbal centers of the brain do not control significant portions of our behavior.

d. It is Inconsistent with Empirical Findings

It takes little effort to show that the belief that unobserved verbal activity causes behavior is patently false or at best is useless as a predictive model.

i. Phobia Can Be Desensitized Without Verbal

It is relatively simple to remove a phobia without the therapist talking about it or the patient being able to articulate what happened.

ii. Blind Sight

Some people cannot report what they see but can act appropriately.

iii. Split Brain Research Contradicts It

A child with a split brain had his left hemisphere exposed to a picture of a chicken claw and the right hemisphere exposed to a snowy scene. When given a set of pictures to match, his right hand (i.e., left hemisphere) chose a chicken while his left hand (i.e., right hemisphere) chose a snow shovel. When asked why the chicken, he said “it goes with the chicken claw.” When asked why the shovel, he responded “to clean up the chicken coop.” This study revealed the erroneous and tautological foundations of mentalistic psychology. Thoughts can be shown to be different than the true cause of behavior and therefore cannot be presumed to cause any particular behavior. A thinking process (i.e., “oh yes, the shovel will be used to clean up after the chickens”) did not determine the behavior of pointing to the snow shovel. Rather, the mental process that the child asserted caused the behavior was created after the fact, even though the child truly believed that the thought caused the behavior.

iv. Extinction is Slow

Imagine a demonstration where a student is seated in the front of the room with a bell and a metal plate on the desk. Imagine further that an electrical apparatus is connected to the bell and plate. Suppose the student rests their hand onto the plate, the bell rings, and a shock is delivered through the plate. Suppose that procedure is repeated 50 times. Now the apparatus is removed to the hallway outside the classroom. The student explores the desk and confirms that nothing of the apparatus remains in the room. The student is asked to repeat "there is no shock possible" continuously. The student then sits at the desk with their hand on the Formica surface after which a bell rings. What do you guess will happen in spite of the student's verbal activity? In spite of verbal beliefs and statements, the behavior of a withdrawing hand will persist until it extinguishes.

v. Self-Destructive Behavior Exists

Ask anyone who smokes cigarettes if they think that it is healthy. The vast majority will respond with something like "smoking is unhealthy, it is hurting me, I wish I could stop." If verbal activity were controlling their behavior, they would stop smoking and would have stopped years ago.

vi. Inconsistent with Physiology

The flaw in reductionistic explanations, especially introspective mentalism, is also illustrated with the simple request "move your fingers so that you can see your tendons move." The fact is exactly the opposite is true, tendons cause the fingers to move. If the mental processing center does not understand that it must activate the tendons to move the fingers (among many other physiological processes people cannot report), then how does it all get done correctly?

III. Explanation Via Specification of Functional Relationships, or: "Correlative"

The proper explanation of a behavior is the specification of the environmental variables which control that behavior by way of the specification and quantification of the contingencies which change it. This class of explanation documents how elements are interrelated by specifying the functional relations among them. Functional relationships are the specification of how a behavior changes with changes in the environment. For example, when the red light is on, the behavior occurs; or as the reinforcement rate increases, the response rate increases hyperbolically. Any meaningful psychological theorizing must ultimately be correlative in nature. If an explanation of behavior does not specify a relationship between empirical inputs and empirical outputs, then it is metaphysics rather than science. These explanations are sometimes also labeled comparative ("what are the characteristic properties"), or functional (in what way does y change as a function of changes in x, or what is the function that describes how y changes with changes in x?).

These general statements can become more quantified and can come to precisely specify an outcome given an input. For example,

$$\log (B_1/B_2) = a \log(R_1/R_2) + \log c$$

specifies the way behavior occurs to two alternatives as a function of the available reinforcers. At this level of specificity, we have a correlative explanatory model.

Unfortunately, the simple specification of the functional relationship (i.e., mathematical or logical relationship) between independent and dependent variables often evolves into some physical or quasiphysical model. What is at first a functional description, becomes a handy comparable process not presumed to be real, and eventually an actual internal process presumed to intervene between input and output. (Cronbach and Meehl label the penultimate and latter implementations intervening and hypothetical variables, respectively; while Hull labeled them hypothetical and intervening variables, respectively. Hull's usage would seem more consistent with typical English usage.)

The impact of a demand for correlative explanations for psychological phenomena cannot be overstated. A coherent explanation of a wide variety of behavior is possible by the specification of the functional relationships involved. Within this class of explanation, different areas of psychology can be seen within a coherent framework based on time scales of adaptation. This change has had a revolutionary and fundamental impact by focusing psychology on what is the same about behavior across a wide range of organisms - not only those that contain a "mind." The knowledge obtained is applicable to all organisms not simply humans or not simply autistic children. We come to understand normal and abnormal humans and animals, from rural or urban areas, from one culture or another, younger or older, richer or poorer, doctors or lawyers, etc.

Note that correlative explanations and correlation have the same root but refer to different things. Correlation specifies a mathematical procedure which specifies how things covary and cannot be used to establish causation. Correlative explanations, on the other hand, specify that the elements of the explanation occur at the same level of analysis and can refer to causal relationships.

A. Temporal Context

1. Historical (time scale of adaptation)

A phenomenon is explained by the specification of the functional relationships which were necessary and or sufficient to generate the behavior. The time scale across which those factors operate is a useful way to categorize explanations. For example, the reinforcement history needed to generate an operant or the evolutionary history of a species needed to generate an instinct.

Note that the following four items are for "second reading" convenience (they are discussed in Chapter 7, Section III. A. 3.).

Instantaneous
Short
Medium
Long

2. Current

This is the explanation for a behavioral phenomenon by the specification of the functional properties currently controlling the behavior. Actually, the cause is the past experience with the contingencies and the current continuation of those same contingencies. For example, a fixed-interval schedule as the explanation for the obtained distribution of behavior, obtained with a fixed-interval schedule.

3. Potential or Functional

This is the explanation for a behavioral phenomenon by the specification of the functional relationships which characterize how the behavior will change with a given change in a parameter. For example, the specification of the dose effect curve as an explanation for the nature of a drug. The data collection which enabled the prediction of the function has already occurred. The past behavioral equilibrium established by a range of past contingencies is used to enable a prediction of what would happen under changed conditions. The cause of the behavior is accepted to be prior to the occurrence of the behavior.

B. Assembly Level of Explanatory Unit

The explanation of some obtained behavioral relationship at some assembly level is explained by appeal to relationships at a different assembly level but which are in the same unit domain.

1. Molecular

We could appeal to functional relationships occurring in smaller groupings or shorter time units. For example, we could appeal to the events occurring immediately before reinforcement to explain the higher rate maintained by a VR schedule than a VI schedule. It could be argued that on a VR schedule, it is more likely that reinforcement follows a later response in a burst of responses than an initial response in that burst, or following an isolated single response. As a result, if bursting occurs, then it is more likely to be reinforced in a VR schedule than in a VI schedule. The resulting greater rate of bursting is therefore responsible for the higher overall response rate in a VR schedule.

2. Molar

Alternatively, we could appeal to functional relationships occurring in larger grouping or across longer temporal units. For example, we could appeal to the difference in the overall rate of reinforcement in a VR schedule when a higher and lower response rate occurs. A VR schedule results in higher reinforcement rates with higher response rates, while a VI schedule provides relatively equal reinforcement rates for all response rates. A VR schedule would therefore be

expected to be ratcheted to higher rates by the differential reinforcement rates.

C. End State, Functional, or Teleonomic Description

Teleonomic descriptions do not posit a cause in the future; they simply specify an end state. If a marble is randomly rolled around in a frying pan with a hole in it, we can say “the marble will roll around until it falls through the hole.” We are specifying an aspect of a variable series as its temporal end point. In fact, we could predict that if we repeated the procedure ten times, we would always get the same result. The marble will eventually fall through the hole, but we are not suggesting that the common end point in anyway causes the rolling around. It is a common property of all the variable series.

We could say that water leaked into a basement because “it finally found” a hole and thereby flowed to a lower level. In the case of the marble and the water, we can make predictions about nature and we can confirm those predictions. But, we accept that neither of these are asserting a sentient or reductionistic process directing the object toward a goal. We are not saying that the water had the intention in advance to move toward the hole and thereby get where it was going, nor even that it was “mindlessly” searching for a lower level. Rather, it means that predictably if the water eventually appears at the hole for whatever reason, then the water will move to a lower level. We understand the process controlling the water: gravity and fluidity.

The vertebrate eye and the mollusk eye (octopus) evolved independently, remarkably they are very similar. This is because the forces which result in variation and selection of the ability to remotely detect visual stimuli are the same in both species. That the two eyes are similar is saying nothing more than two marbles fell through the same hole in the frying pan. Neither the two eyes nor the two marbles were seeking the same goal, but rather were responding to the same laws.

Descriptions of this type are often termed functional explanations. The word explanation is applied because, to the degree that we correctly understand the laws describing the behavior of a thing, we can predict "where" it will be at some indefinite time in the future (the marble will fall through the hole). While we can be satisfied that we understand something about the process and that we have in some way explained something when we can predict its end point, we cannot suggest that the prediction or the end state is the prior cause. Often however, we do not have sufficient knowledge of the end point or the functional relationships describing past and future occurrences; so our predictions may not be accurate in changed situations.

D. Conceptual Follow-up

1. Reductionistic Versus Correlative (Behavioral) Explanations

The difference between behavioral and reductionistic views is fundamental: pass the skin and you are a biologist or a philosopher, not a psychologist. The following anecdote illustrates the different interests different people can have in how a system works. Suppose that after wandering around in a desert for a few days, you came upon an entirely unknown soft drink dispenser. You phone the manufacturer and asked, "What makes the soft drinks come out?" The manufacturer answered, "When the can release cog is actuated into the release mode by the activation wheel." You then rasped, "What turns the activation wheel?" He then answered, "The activation wheel motor." You then, a bit less politely asked, "What makes the activation wheel motor turn?" The engineer unflappably responded "The activation wheel motor transistor enabling circuit." After a seemingly interminable delay of being educated about the internal workings of the machine, how those parts were made, where they were purchased, what color they were, and how they were assembled, you would scream that you were a behavior analyst and you wanted to understand how to control the behavior of the machine not manufacture one. The manufacturer would raise his eyebrows and condescendingly quip, "Well, if you must know, you put the money in slot 14 and then push the red button two times."

Psychologists deal with environments and behaviors. For example, if a TV picture isn't exactly what you want, you usually give it a signal with the remote control to change. You don't open up the back of the TV and start changing transistors and ripping out wires. TV sets have evolved just as biological organisms have. Adjustments which have to be made often and locally are under the control of signals in the environment sent by the viewer. Channels can be changed, the volume can be raised or lowered, and so on. Ultimately, of course, all those things are mediated internally by circuitry, but this is not typically what we mean when we ask: "How do I change channels." From the practical perspective, what causes the channels to be changed is pushing buttons on the remote control, not changes in the inductance of a circuit.

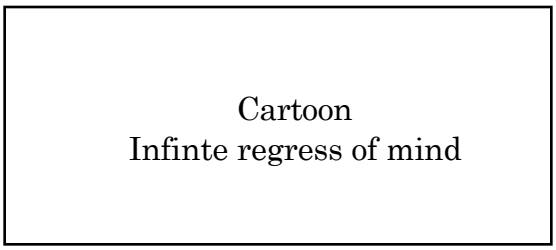
The same goes for life forms and their behavior. They, too, have evolved. The adjustments which need to be made often and locally are under the control of signals in the environment. Organisms learn as the result of nonrandom relationships in the environment. Ultimately, of course, all those things are mediated internally by the biology of the organism, but this is not typically what we mean when we ask: "How do I change that organism's behavior", or "what caused the behavior to be changed." The answer we want is what are the changes in the environment which will lead to the new equilibrium, not what changes in neuronal activity will lead to the new equilibrium. The conceptual difference is the difference between psychology and biology. The difference between the medical model (reductionistic) in psychology and the behavioral model (correlative) with psychological problems can be seen as the difference between seeing behavior as "blown transistors" versus "knobs set wrong." Medical people

fix transistors, psychologists turn knobs.

An example of the enormous difference in the power of a correlative approach over a reductionistic approach can be seen in the task of being responsible for helping someone develop muscles. Muscles are obviously of biological substance and are made up of cells. The revealing question is: what types of knowledge and what approach will be most productive in helping you accomplish your job, biology or psychology? It is your ability to provide reinforcers for lifting weights that matters most in helping someone develop muscles, not your understanding of the cellular structure of muscles. When considering the issue of the difference between people with or without muscles, or how a person gains or loses muscles, muscles are best seen as the result of environmental experiences not cell growth. The value of an environmental approach to something as biological as muscles reveals the even greater importance of an environmental approach for issues such as personality, attitude, and any other aspect of psychology.

2. Mentalistic Versus Correlative (Behavioral) Explanations

The difference in a behavioral and a mentalistic explanatory strategy is the difference in the paradigm's willingness to be satisfied with what is ultimately a ridiculous answer. A frequently invoked reductionistic metaphor for how an organism comes to behave correctly is a telephone switchboard and an operator. For example, a stimulus is presented to the organism. It is said to travel to the processing center where the switchboard operator evaluates the stimulus, decides on an appropriate course of action and activates the appropriate effectors. This metaphor brings great comfort to many students of psychology. For example, in order to explain how an actual telephone operator at the phone company functions, we could say that the operator (outer) receives a stimulus (outer). This stimulus is sent to the operator (inner), who decides what to do and activates the proper response (inner) which causes the operator (outer) to behave (outer) correctly.



To argue that an operator knows what to do because an internal operator knows what to do is patently ridiculous as an explanation. Similarly, to argue that a rat learns a maze because a human telephone operator in the rat's head looks at a cognitive map, or to argue that a child behaves similarly on several tasks because a telephone operator in the child's head looks up a rule in a rule book is silly. That type of reductionistic "explanation" is tautological. The power

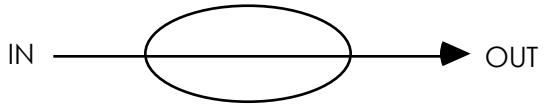
of a telephone operator explanation to account for baffling empirical findings is an illusion. It is like the cartoon mathematical derivation which jumps over a difficult step with the note "and then a miracle happens." The question to ask is how does the telephone operator come to behave the way it does.

A critical point of focus in evaluating any theory, therefore, is the degree to which it invokes some unknown decision-making process within the organism to decide what to do (e.g., the inner operator telling the outer operator what to do; the child **using** a rule to decide which alternative to select; the rat retrospectively **evaluating** the correlation, etc.). To the degree that the behavior of an inner entity decides the behavior of the organism, the explanation is empty, and is, in fact, silly.

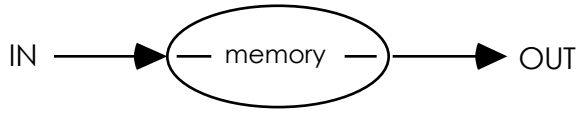
The trap is that a reductionistic explanation will always, on the surface, **appear** to make sense out of the behavior of the subject and therefore will always **appear** to be a better explanation than a behavioral explanation. This is because the inner operator is always magically given whatever knowledge is necessary to get the outer operator to do what it did; whereas a behaviorist must actually find out what experiences made the behavior occur they way it did. A behaviorist would argue that explaining how the outer animal behaves with the use of an internal processing center is simply explaining on "credit." The real explanation is simply put off for another day and will eventually have to be paid in full with interest. Spending explanatory capital that you do not have requires that you then focus your effort on paying back your debt.

In the same way mathematical models "fudge" over unknowns with free parameters (they can take on any value necessary to make the prediction work), so too can theoretical internal processes be used as free parameters. If a person uses a strategy to encode and decode information, then we have at least four free parameters or places where we can come up with whatever excuse is necessary to explain the obtained results. The person may or may not have had the correct encode strategy, they may or may not have used the encode strategy, they may or may not have the correct decode strategy and they may or may not have used it. If we add "wanting" to use (i.e., the person had the knowledge, and had the strategy, they just didn't want to use it), and "inhibition" (i.e., the person had the knowledge, and they had the strategy, and they wanted to use the information; it was just that they had an overactive or underactive inhibition center).

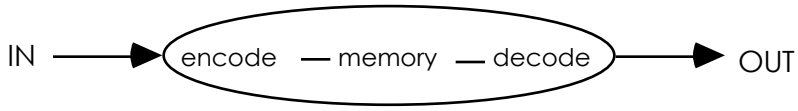
Consider the following figure as the evolution of a game. Your job is to predict whether a ball bearing will roll out the other side of a black box; the inside of which you cannot see. In this first game, if the inside of the box is as pictured, you can make a reliable prediction by noting whether or not a bearing is rolled into the black box.



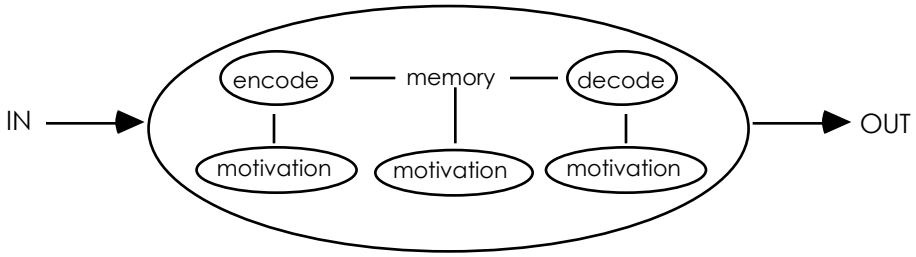
Your opponent can place some reductionistic process in between the input and output without your knowledge. That stage can then let the bearing through or not. In the following example, you would be unable to make a reliable prediction until you knew: 1) whether or not the bearing rolled in, and 2) whether or not the memory passed the bearing.



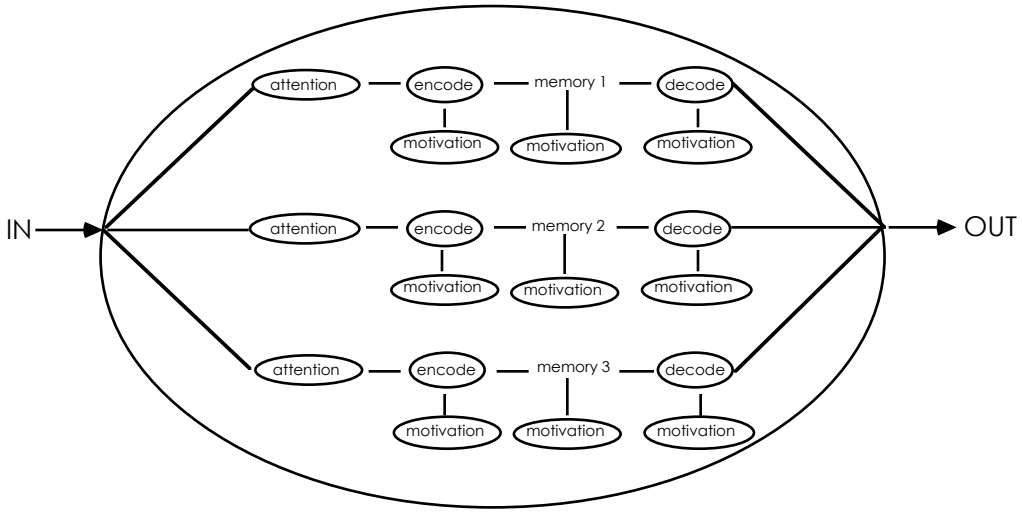
Once you knew the state of the memory, you could make reliable predictions again. However, your opponent could then add an encode and or a decode stage. You would then require information on the state of three elements (eight possibilities).



Once you knew which of the eight possibilities was in effect, you could succeed. However, your opponent could then add motivation which would increase the required information to 64 different possibilities.



Once that task was surmounted, your opponent could add an attention process and several different types of memory.



In the same way this unconstrained proliferation of reductionistic processes would make your ability to predict behavior impossible, it oddly enough also makes it simple to make excuses for, or to seemingly explain anything. Whenever an unexpected result occurs, an additional underlying process can be postulated to cause it.

Clearly, the free parameters available to a reductionistic system such as the preceding unprincipled cognitive example can make it appear that the theory has the flexibility to explain anything. The issue is that this self-serving type of theorizing explains nothing because the complexity of the model is as great as is the complexity of the phenomenon.

Mathematical models declare their number of free parameters and lose credibility as they increase in number. Theories should be equally obliged to declare their degrees of freedom and be willing to be evaluated in that light.

The entire issue is brought into sharp focus with the principle "smart animals prove the experimenter stupid, stupid animals prove the experimenter smart." What this principle means is that we as professionals must know what causes behavior, not simply come up with impressive names for it. For example, we could presume that the herring gull was smart because it knows that it must retrieve its eggs when they get bumped from the nest in order to keep them from dying and in order to preserve the species. We could give the bird any number of complex realizations, processing centers, or divine inspirations. We could try to impress our colleagues by showing how smart the birds were.

However, relatively straightforward research which varied the color, speckle pattern and size of artificial eggs showed that eggs were retrieved in the order green > yellow > brown > blue; more speckles > less speckles; and large > medium > small. This showed that stimulus conditions governed egg retrieval

and that some unnatural stimuli worked better than natural stimuli (which were, in fact, brown, moderately speckled and a medium size). Similarly, a snail could be said to be smart because it knows to climb to the top of a tree in order to get to the most tender leaves. However, research has shown that the snail moves so that its shell pulls "back" (i.e., negative geotropism).

A herring gull can be made to retrieve very large pieces of green highly specked wood more than its own eggs and a snail can be guided toward the worst leaves by pulling on its shell. Both of these behaviors are inappropriate and in fact very destructive to the individual and species. They are stupid. Simply put, animals do things because of environmental causes not because of optimization. If you know the environmental causes: 1) you can make the animal do something stupid by controlling those causes, and 2) you can prove that you understand the psychological process controlling the behavior.

The Renaissance provides an exceptionally clear example of the importance of understanding empirical correlative causes of behavior and the vacuousness of even the most impressive sounding internal causation. Human beings react correctly to distance in the environment. They can throw an object to correctly land in a box placed 5 or 50 feet away. They can say "that thing is far away, this thing is close." Before the Renaissance, the "knowledge" of distance was an internal intelligent wondrous skill humans had. Humans reacted correctly to distance because they were smart. They had a depth realization center in their mind. A little research showed that "perspective" or the convergence of parallel lines in the distance made humans say "that thing is far away, this thing is close" even though both things were equidistant. Humans were shown to be incorrect with respect to depth (i.e., humans were shown to be stupid). The discovery of the environmental determinants of distance or depth perception (apparent convergence of parallel lines) in Florence in the early 1400s proved Alberti brilliant and changed the world forever.

The events in the environment which control different behaviors as a function of their changes are what we mean when we ask for an explanation of how we see depth, and those details are what we want when we want to know how to paint a painting or make a two-dimensional movie appear to be three-dimensional. When we have a practical problem to solve, the mind of a homunculus is obviously useless tautology we want to know the factors that change behavior.