MAIER'S LAW [1]

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PARKINSON (1957) formulated some laws for management that contributed to the understanding of the way executives behave. Thus his law, that executives make work for each other, explains why they can keep so busy accomplishing nothing. It seems that scientists, psychologists in particular, are entitled to similar consideration. They, as well as executives, behave; and there must be some laws to describe their behavior. Since I am formulating one of these laws, it seems only fitting that it be named Maier's Law.

Maier's Law states: *if facts do not conform to the theory, they must be disposed of.* It also follows that the bigger the theory (i.e., the more it encompasses) the better. Notice that the mere formulation of this law lends a new dignity to the scientist's most precious thing: the theory. Einstein's prestige as the world's greatest mind in modern times stems from his theory that encompasses all matter from the atom to the celestial system. It is a model to follow, and theoretical psychologists are now at work to build a behavior theory that will do the same for psychology.

There was a time when a theory was nothing more than a tool the scientist used in assisting him to make discoveries. He sort of used a theory as an aid to organize his facts. It was easier to remember a theory than a large number of facts. When his theory did not hold all of the facts, he just remembered the few exceptions and in this way was able to carry on his research without too much strain on his memory. The value of the theory was that it made him more able to explore for more facts. It seems that the scientist was like an explorer: always wondering what lay beyond the known. Knowledge that satisfied curiosity seemed to be what motivated the scientist.

However, with Maier's Law, the theory supercedes the fact. It is the fact that must conform; and it is the theory that we must strive to nurture, develop, and abstract. If it can be reduced to a formula, it will become a scientific model; and nothing can be more important than that because, once a theory can be expressed mathematically, it is pure. It follows therefore that, when this is accomplished, the prime objective of the scientist has been reached. Thus it is understandable that scientists will compete with each other in terms of how universal their respective theories are. Suppose one scientist can claim to have 1,000 facts supporting his theory while another has 10. The mere consideration that in the first instance there may be 100 facts in conflict with the theory and none in conflict with the second does not materially change things since the balance of 900 is still greater than 10. However, this does not mean that the 100 facts should not disturb the scientist with the big theory. He would like to dispose of the unruly facts and increase his batting average.

Disposition of Facts

The method of how psychologists as scientists dispose of facts is of special interest. One of the most common is to give the facts a new name. In this way they are given a special compartment and therefore cease to infringe on the privacy of the theory.

Let us take as an example the phenomenon of "imprinting," which is a name given to the observation that young animals follow the first object they see. Since this object is usually the mother, it is clear that young chickens will follow the mother hen. However, under proper rearing, a bird will follow a hand as faithfully as a mother.

Note that this phenomenon is not called learning. According to learning theory a response must be reinforced to be learned. Since the young animal's first impressions are strong—because they are first, not because they are reinforced—it is clear that this is not a form of learning, as specified by the theory. By calling the phenomenon "imprinting" it is differentiated from innate behavior and yet is fenced off from learning and hence ceases to be a threat to learning theory.

There was a time when animals were thought to learn according to such principles as primacy, re-

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cency, and contiguity; but that was before reinforcement was found to be necessary. Such principles go back to Aristotle who was a philosopher rather than a scientist. It can readily be seen that, if imprinting were explained in terms of primacy, it would be a threat to the generally accepted theory of reinforcement and the facts would have to be questioned. However, if the facts are regarded as a different kind of phenomenon and given a name such as "imprinting," similar phenomena can be placed in the same category and this will preserve the data without causing an inquiry to be made regarding the errors in the scientist's methods. Naming phenomena, therefore, is one of the ways for disposing of data that threaten a theory.

It also goes without saying that a young man could make quite a reputation for himself if he could find some way of amending the reinforcement theory to incorporate the imprinting phenomenon. In this way the theory would be expanded and thereby improved rather than threatened.

Another example of disposing of experimental findings is found in connection with the research on extinction. According to learning theory, a response that ceases to be reinforced gradually becomes weakened and subsequently disappears. However, in working with dogs it was found that, if a signal is followed by electric shock, an avoidance response can be developed so that the avoidance occurs whenever the signal is presented. If now the shock is eliminated, the dogs continue to avoid shock. Details of this research revealed that in certain experiments the dogs continued a now useless avoidance response despite the fact that reinforcement learning theory, derived from other facts, called for its extinction. This new finding suggests that either the observed facts are incorrect or that the theory is inadequate. In this instance the day was saved by describing the results as traumatic avoidance. Obviously one cannot expect the same results under traumatic as under normal conditions—otherwise, trauma would be a normal state. So the findings are nicely tucked away and become of interest clinically without interfering with a good theory. No one can expect learning theory to serve as a clinical theory and account for the changes that occur in therapy. If this were the case, therapy and learning would be the same.

Giving disturbing facts a name is almost as good as explaining them because a name supplies a useful answer to inquisitive people. For example, a lecturer in describing the habits of people living near the North Pole told his audience how children ate blubber as if it were a delicacy. Later a questioner asked the speaker why these children liked a food that would not be attractive to children living here. The lecturer replied that this was so because the children were Eskimos. The questioner replied "Oh, I see" and was satisfied. In a similar manner the word "catharsis" explains why we feel better after expressing pent-up feelings.

Scientists have developed large vocabularies to account for various behavior phenomena. We have "inferiority complexes" and "superiority complexes" to explain opposite kinds of behavior. Then too, behavior may be described as anal or oral depending on its nature, and perhaps on the therapist's perception at the time. Classification is one of the scientist's important functions; and the more complex the classification system, the more it simulates an explanation. Thus the development of a science is revealed by the complexity of its vocabulary.

During the immature period in psychology we had a long list of instincts. Every known behavior could be traced to a specific instinct, and this classification became the psychologist's way of explaining why animals do what they do. As new facts were discovered, new instincts were invented to account for them. Scientists were engaged in finding new behavior instead of restricting the animal to a couple of alternatives that could be handled as we do now. Finally the list of instincts became so great that the examples falling within a classification became fewer and fewer. As a matter of fact psychologists debated over who had the best list of instincts. This condition gradually raised doubts in the minds of scientists because, with so few items of behavior in a class, it seemed that behaviors were being named rather than classified.

The school of behaviorism frowned upon this trickery and demanded explanatory principles. For the cause of scientific accuracy, a lot of phenomena had to be denied out of existence. Soon, however, it was recognized that this theory had many limitations, since common experiences, such as thinking and love, were being denied. This problem made researchers realize that some improvements had to be made. Needs were added to behavior theory, and as a result the theory became more elastic and vague. When the known needs were found to be inadequate to account for the facts, new needs were invented to incorporate the behavior. This convenient practice led to a multiplication of needs. Today, we are presented with such things as needs to belong, to destroy, to conform, to achieve, to explore, to reduce tension, for revenge, and a host of others. It appears that the history of instincts is beginning to repeat itself in that too large a list of explanatory factors creates dissatisfaction. Thus it might be thought that the need to discover needs may actually destroy the need-classification system. However, one must not lose sight of the fact that modern computers can handle any number of parameters with ease, so complexity no longer is a deterrent.

It should be pointed out that the technique of naming can also run into disrepute, depending on what one does with the business of naming. A German scientist reported researches which he claimed demonstrated that chimpanzees showed insight. The book was interesting reading and made chimpanzees appear almost human—perhaps too human. However, the claim for insight was used to show that the American theory of "trial and error" problem solving was inadequate. According to trial and error theory an animal, when confronted with a problem, expresses a great variety of behaviors. Eventually something works (i.e., a particular behavior gets the animal food, or it releases him from confinement) so that gradually the animal learns to do the thing that works (reinforcement). This analysis shows that what appears to be intelligent problem solving is nothing more than learning. All that is needed is to overlook a few differences and to point out how useless behaviors drop out and sensible behaviors are retained; thus the scope of a learning theory is increased to include behaviors that to the naive observer (a person deficient in thinking theoretically) appear intelligent.

The German scientist's facts were obviously incorrect, even though he had gone to great pains to show that previous trial and error activity could not have taken place. He claimed that his chimpanzees had never had a chance to stack boxes under a bunch of bananas to get the coveted food and hence could not have learned the solution. However, this was not convincing evidence. Critics said he had not raised the chimps from infancy, hence he did not know their past. Whether this was relevant or not is beside the point; it was true. So his many tests of insight were regarded as no different from the performance of a horse that pulls a wooden plug from the post to open a gate, and it is known that horses learn this by trial and error. By classifying these kinds of observation together the need for a new theory is nicely eliminated. Even though the German scientist tried to differentiate between sensible and senseless problems to explain the difference in insightful and trial and error problems, it is clear that he was on the defensive. To clinch the matter, it was later shown that even monkeys can learn to stack boxes and to use tools to get food. If they can learn to do these things, it proves that the chimpanzees that did such things must have learned the tricks rather than figured them out. Thus the newly observed phenomena were denied, and the claim that learning could not account for the behavior was logically handled by his critics. Sometimes it is better not to observe the original behavior because many potentially disturbing details are lost in the process of tabulation. The motion pictures that the scientist made, therefore, continued to disturb scientific thinking.

For some years the debate continued as to whether there was anything higher or more complex than learning. Finally a generally acceptable compromise was reached. The name of "insight learning" was given to behaviors that were used to challenge the adequacy of learning theory. This way of combining "insight" with "learning" brings peace to the disturbed learning theorist. He can now explain ordinary learning with the simple formula he used before and in addition recognize that sometimes things occur quickly. This quick learning or insight learning is nothing but ordinary learning speeded up. Intelligent behavior thereby becomes different from dull behavior in degree—not in kind. The dissolving of the qualitative distinction clearly brings things within the scope of the theory. Learning theory thus approaches behavior theory.

Another combination of concepts that accomplishes a similar objective is that of "latent learning." New behavior of this type may appear without previous reinforcement trials; and, since learning trials were not present, the learning is called latent. An example of this is when an animal goes to a food place where it has been confronted with food, but never ran the particular route in connection with food before. Thus, if a cat was shown food under a kitchen table and then was carried into the living room, it might run directly to the food. If the path it follows has never been one that was previously rewarded, its choice of path could not be due to previous rewarding. By naming something that occurs on the first trial "latent learning" one is not questioning learning theory, rather the theory is expanded. That learning requires previous trials should not be taken too seriously. Eight-trial learning is one less than nine-trial learning, and no previous trials is one less than one-trial learning. Even better, let us think of no previous trial learning as one-trial learning since the observed phenomenon occurs on the first trial, and that is a fact.

The reader will be able, from this point on, to find his own illustrations; and perhaps he will be able to understand why some of his own researches have missed being mentioned in commonly used reference works and why others, for reasons that escape him, receive a surprising degree of popularity.

Since, with the mass of research publications, previous studies are perpetuated through secondary references, it is easy to see how, in a single generation, facts supporting prevalent theories can be selected while facts unfavorable to existing theories can be lost. This is the third method for disposing of facts: that of omitting them in reference books. This method nicely reduces the literature and prevents the young scientist from becoming discouraged. Limitations in the number of periodicals can serve a similar purpose; and, if the editors have a theoretical orientation, they can prevent the appearance of disturbing facts by indicating the things the research worker failed to do. With a little planning one can see how a theory can be sold and perpetuated by effectively utilizing this third method.

However, these lost facts can be rediscovered; and, if properly named, the rediscoveries may achieve recognition. The important thing when rediscovering facts is not to mention their former existence. Reincarnations must always be in a form different from the former state and, of course, should have a different name. As long as we have enough scientists and research money, we can afford to lose facts. The very process of rediscovering them is a training experience for the new generation of scientists.

Finally we must mention the most efficient method for disposing of disturbing facts: that of failing to report them. This method, if skillfully handled, permits a selection process so that only the "relevant" facts are reported. Naturally it takes a critical individual to determine what is worth reporting and what is irrelevant. For example, one researcher reported that his experiment on delayed reaction was conducted on the third floor of the building but did not tell how many tests he ran in a day. Later it was found that the number of tests per day determined the length of a delay, while the floor used was not important. Since selection is always with us, what better aid is there for the selecting of facts than a good theory.

Research on discrimination learning reveals that some animals cannot learn the problem put to them while others can. How does one study the way animals learn a task that is crucial to a theory? Naturally, only the scores of animals that learn should be reported. In the early days, it was customary to include a statement such as: "Ten animals were dropped from the experiment because they could not learn." The reporting of this selection of data was deemed wise because it was a fact. More recent researches discard animals that fail to learn, but this need no longer be reported because the custom of discarding animals is now a generally accepted practice.

One experimenter made a study of the animals that could not learn discrimination problems and reported his findings. His results had to be discounted because they were inconsistent with the findings of other research workers. Thus consensus of opinion becomes an important factor in selection, and at the same time it is democratic. Perhaps rats should be taught the theory they are to follow.

According to Maier's Law it behooves young researchers to discover new phenomena and to use discretion in naming and interpreting the findings. If he has difficulty in finding new things, he may find it worthwhile to read the literature (not secondary references) that preceded modern theory. By selecting the lesser researches, he may be led to the "bad" yet worth salvaging facts.

EXTENSION OF MAIER'S LAW

A good theory can be expressed as a formula. Any theory that cannot be quantified is inadequate even if it works. This law naturally violates the principles of pragmatism, which favors applied rather than pure science. A pure theorist is interested only in perfecting a theory, and he should be allowed to retire to the ivory tower where he can limit the variables and the dimensions of freedom, so that disturbing alternatives do not occur.

Let us explore for a moment how good theories may be hit upon. Suppose we investigate crowding in housing. We find that this phenomenon is directly proportional to the number of persons and inversely proportional to the size of the area. This type of problem can be expressed by the formula $Cr = N/Ar$ where Cr is crowding, N is number of persons, and Ar is area. However, things are not quite this simple, so I had better explain. Obviously children (C) and adults (A) contribute differently to crowding, so some constants (K) are needed. This is a research question. Does an adult crowd more or less than a child? If there is a difference, then we have to separate adults and children so that

$$Cr = \frac{NKA + NC}{Ar}$$

But all areas are not the same either. Space outside the house, number of floors to a house, etc. must be taken into account; and this requires additional constants and distinctions. Already the problem is taking on the form of a good mathematical model. Unfortunately it is too difficult for me to pursue since I am a psychologist rather than a mathematician.

REFERENCE

PARKINSON, C. N., *Parkinson's law and other studies in administration.* Boston: Houghton Mifflin, 1957.