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# CHAPTER 1

# The Relevance of Science to Psychology

It is because of science's track record in producing desirable results that psychology is moving toward "science" as fast as it can. Science is only one of many ways of viewing the world. However it should be realized that science, which specifically rejects trying-to-do-good has produced more good than any other system. It seems that being focused on correctly understanding nature has the side effect of producing "good." Whereas being concerned with "good" very often has the side effect of producing half truths, misunderstanding, and horror (the Spanish Inquisition, the Salem witch trials, and Auschwitz).

Science does not produce statements that get to be labeled "the Truth." Rather, what we mean by the ground rule only-demonstrable-real-world-truth has come to be labeled science. The correspondence between science and truth is NOT because there is some ineffable thing "truth" and science reveals it, rather, that which science reveals defines truth. Truth has no further meaning.

A key to understanding the activity labeled science; what it is, what it's not, why it's emphasized in courses such as this, and why you should follow its guidelines lies in the way it came about. It did not come into existence when some authority figure defined a creed called "Science"; and then began ordaining people as "Scientists" if they took the oath. Science came about when people who demanded to know the truth and who demanded to understand what they were doing were seen as a group and came to be called scientists. The procedures that avoided erroneous conclusions and which lead to correct predictions came to be called the scientific method. These methods of science are best seen as conventions that have evolved through the pressure brought about by a primary emphasis on correctly connecting to the world. Science is simply man's attempt to keep from being deceived by nature.

When you have something important at stake you demand what you label truth. You should be no less scientific when the body of knowledge or the welfare of your patient is at stake. The following anecdote illustrates that whenever it matters to you, you already know enough to demand the truth, and to understand what's going on (i.e., to be scientific). Suppose that you and I were going to bet \$100.00 on the outcome of a coin toss. I flip; you call heads while it is in the air; it lands, I cover it, sneak a look, call it tails, and quickly put it in my pocket. You would not pay. You would demand that you see an outcome before believing it or you would require that trustworthy people see an outcome and report it to you. The fact is, if you are uncertain about something that is personally important, you appeal to direct observation as your final arbiter. It is what you can experience for yourself that ultimately determines what you accept as truth. If someone tells you something, you assess its truth by asking whether or not you can experience it directly or indirectly; whether there are several lines of evidence supporting it; whether the information is consistent with information from several other sources which are generally reliable or whether the information is consistent with what you already know is factual. When this informal notion of appealing to direct observation is used in an explicit, open, and consistent fashion, it is called the scientific method.

There is occasional resistance to the idea that psychology can be scientific. This resistance is based in a belief that behavior can never be understood, i.e., be measurable, analyzable, or controllable. This objection typically takes one of two forms: that behavior is capricious and without a cause, or alternatively, that behavior can be understood only by methods that are incomprehensible, unlearnable, or innate in a few very special people. (This latter view is typically argued most vociferously, of course, by people who think that they have that special skill.) The objections to scientific psychology are obviously not true when one considers the many professions that exist because of their ability to routinely on command, such as advertising, public relations. change behavior entertainment, education, and politics. However, even if the objections to the comprehendibility of behavior are partly true we should get on with understanding what we can understand, and not be stultified by what at best is only a half truth. We should assume that we can have an impact on behavior unless proven otherwise.

# I. The Challenge You Face

If I were to ask you to list five good things about lynching someone, you would, after the shock of the apparent oxymoron wore off, put down that it's quick, inexpensive, requires no difficult or complex preparation, and that those who do it claim that it's appropriate, and that they enjoy it because they're helping society. If I were to ask you to list 5 bad things about civil law, you would point out that it is slow, expensive, requires a lot of preparation and work, and is stressful because it must be done right and isn't always fun.

The challenge faced by someone interested in psychology is analogous to that faced by a judge. We can do to our readers and patients what feels intuitively satisfying and what does not require taking difficult courses or we can become properly prepared at whatever the cost to do what is objectively the best thing possible. In criminal justice, no one argues that the easy path (lynching) is better than the hard path (civil law). We should be equally offended when someone in psychology wants to do things in some particular way simply because it is the easiest way to graduate and has the least homework. The following step by step explicit reasoning shows that science is relevant and even essential to psychologists involved in either the application of psychology (psychotherapy) or to the discovery of new behavioral principles (research).

# II. Resulting Onus: What <u>You</u> Accept as <u>Your</u> Obligation

The first step in building a logical foundation for your practice of psychology is to decide what is at the heart of your system of wants, beliefs or values. An onus is the most primitive or most basic demand a person feels obliged to meet, even if it is not fun and even if it is not easy. Generally these are obligations so basic as to require no justification. The logic of this section addresses itself to the question: is there any reason for you to do anything other than the easiest, fastest, simplest most natural thing that any 15-year old already does in the practice of your profession? Is there any reason to know anything more than you already know or to behave any differently? Is there any reason to expend the extra effort to actually "see the dolphin" rather than simply going around saying what you know by intuition?

#### A. Do What it Takes to be Ethical

People often verbalize that they are willing to work hard in order to be ethical. It is important to provide a clear operational definition of what it is to be ethical by enumerating instances of being ethical. The following set includes some of the typical things that people consider obligatory.

#### 1. Do Unto Others as You Would Have Them Do Unto You

You would want to go to a maximally competent therapist who understands what is really going on and how to fix your problem. You would want to read a maximally revealing paper that helps you understand what processes actually occurred.

#### 2. Greatest Good for Greatest Number

In complex situations where no simple "completely right" versus "completely wrong" decision can be made, a maximizing rule only makes sense. Any decision should be based on an understanding of the big picture rather than a first, narrow impression. What is the best answer for the larger perspective out of the possible alternatives? What will most positively affect the greatest number?

#### 3. Others' Interest Before Self Interest

If you have to study more to understand a problem; work harder to get the job done; research more rather than publish sooner; or give up an erroneous position to which you are emotionally committed, then so be it. Decisions should be based on the facts rather than self interest.

#### 4. Efficiently Eliminate Ignorance or Relieve Suffering

If you do therapy you must know how to help people and help them in the best possible way. If you are adding to the knowledge base of psychology by doing research, you must provide your reader with the most useful knowledge presented in the most articulate way possible. The best solution requires a clear understanding of the actual factors involved.

#### 5. Deal With Your Limitations Honestly

Know what you can or cannot do. Solve the problem when you can, but defer to others when appropriate. Terminate if you are not helping, even if it means a loss of income. Pass a research question on if you cannot handle it. Your decision must be based on your ability to understand the determinants of the task.

#### B. Review: The Onus to be Ethical

The preceding list of skills, activities, and attitudes is generally labeled ethical. They are what gives psychologists the right to consider themselves better than money-grubbing self-serving con artists. A Psychologist who simply does what he thinks is right or feels is right or knows is right is really no better than a con man. They both usually hurt people, produce half truths, and are called quacks.

It is morally wrong to do something other than what is maximally beneficial and maximally efficient to someone in your care. It is morally wrong to publish a paper that leaves an impression that is not supported by the facts. The ethical foundation of psychology therefore hinges on truly understanding the nature of behavior, truly understanding the problem at hand, truly understanding the best solution and truly understanding the best way to accomplish the solution. To the extent that we have maximized our understanding of what is truly going on, to the extent that we truly understand the issue as well as anybody, we are ethical. To the extent that we use second-rate information or have a second-rate understanding, then we are unethical.

### C. Do What it Takes to be Prosperous

People often verbalize that they are willing to work hard in order to be prosperous and have a good quality of life. It is important to operationalize this term.

## 1. Good Job

A job that you enjoy.

## 2. Security

A job that allows you to make and obtain long-term goals.

## 3. Upward Mobility

A job that provides you with more frequent promotions than average.

## 4. Job Satisfaction

A job that enables you to feel good about your accomplishments.

## 5. Provide for You and Your Family

A job that allows you to provide your family with security and material goods.

## 6. Recreation

A job that allows you to enjoy life outside the work place.

## D. Review: The Onus to be Prosperous

Psychologists have a right to expect to be prosperous in their profession. You have a right to expect a good job. However, it is not enough to only want to be a psychologist, you have to be good at it to succeed. Therefore, there are pragmatic reasons, as well as ethical reasons, for you to truly understand the nature of behavior, truly understand the problem, truly understand the best solution, and truly understand the best way to accomplish the solution. To the extent that we have maximized our understanding of what is truly going on, to the extent that we truly understand the issue as well as anybody, we are likely to be successful. To the extent that we use second-rate information or have a second-rate understanding, then we are in jeopardy of being unsuccessful. The following list of skills are likely to help you in becoming successful and secure in your profession.

# III. Knowing What You Are Doing Will Make You Ethical and Prosperous

Most people probably feel some onus to do what it takes to be ethical, and some onus to do what it takes to be prosperous, even if it's not the path of least resistance. The second step in building a logical foundation for your practice of psychology is therefore to determine just what will make you ethical and prosperous. Being ethical is not the same as doing what you think is right, and a good life is not something you are guaranteed by graduating. In point of fact, both require that you know what you are doing. The following is an operational definition of knowing what you're doing.

#### A. Separate Illusion from Reality

All theories claim to be correct and all therapies claim to be right. Some theories are wrong. Just as all parents consider their children good kids, all weight loss programs claim to work, and all used-car salespeople claim that their cars are good buys. Unfortunately, the immediate, naively perceived, "real" world can trick us like a magician tricks inexperienced children. If you are to become a good consumer of psychological knowledge you must be able to separate truth from fiction even when appearances are deceiving.

#### **B.** Solve Problems

A simple technician can cope with problems once they are trained to step through that particular solution. A professional on the other hand can solve problems which have never before occurred because they are trained how to solve problems and find the real answers. The ability to discover the true determinants of behavior is an essential prerequisite of being a professional. The difference between a bright high school graduate with 7 years of experience in the "real world" and a person with a doctorate is the difference between vocational and professional training.

In general, a professional must have the analytical skills necessary to unravel complex behaviors into understood functional relationships, and the competency to design procedures which will clarify causal factors or which will alter behavior. For example, when Gauss, a brilliant mathematician was required to add all the numbers from 1 to 1000 as punishment for some transgression in grade school, he realize that the answer was (n+1)/2, which is painfully obvious once someone tells you about his realization.

#### C. Function Without Supervision

The best jobs go to those who can function without supervision. Workers who

only can do what they are told are a dime a dozen.

#### D. Ability to Implement Recondite Information

The knowledge base of humans has surpassed what is explainable to a 5 year old. In fact it has surpassed what is quickly explainable to many college graduates. You must be able to understand the advanced and sophisticated knowledge of psychology in order to properly function as a psychologist. Psychology has come an unimaginably long way since 1950 (about where history of psychology books leave off) and a very long way since the 1970s when most current faculty graduated.

#### E. Make Consistent Progress

If you are to succeed at what you are doing you must be right more often than you are wrong. You must make consistent progress. If you are to make consistent progress then you must know when things are getting better and when they are getting worse. In fact, a theorem in mathematics shows that unsystematic (random) movements get nowhere. A drunk walking from a lamp post and turning randomly will not stray far from the lamp post. This is true for both the field of Psychology as a whole and you as an individual researcher or therapist.

Consistent progress requires the ability to separate correct from incorrect feedback. With accurate feedback, errors can be eliminated and correct solutions obtained. Imagine getting your clues in the game "hotter and colder" from someone who doesn't know where to steer you. You would stumble around, always thinking you were on the right track but in reality you would be lost, never getting any closer to the solution. Similarly, common sense is useless in psychology, it moves you back and forth in no consistent direction. For every adage that points you one way, there is another one which moves you the other way (e.g., it's never too late, you can't teach an old dog new tricks / he who hesitates is lost, look before you leap).

#### F. Be Effective and Be Able to Prove It

To be ethical, you must be effective. Additionally, you will be required to demonstrate the efficacy of what you do when the people supplying your income become good consumers.

Agencies which fund psychological services or research expect to get something for their money. This is increasingly so as government agencies become more accountable for their expenditures. You will be required to show that you produced something.

The courts are increasingly involved in psychological services. Malpractice suits are now a part of professional psychology. It is likely that you will be required to present evidence admissible in a court of law, and under cross examination which proves beyond a shadow of doubt that your procedures work.

The outcome of a malpractice suit against you is governed by the nature of your knowledge. What would you consider important if you were a juror on a malpractice case brought by a friend of yours? What would the therapist be obliged to prove and what would be acceptable evidence? What would make you side with the therapist against your friend? Whatever that is, should of course, be the foundation of your practice of psychology.

The hallmark of free enterprise is that the best are likely to prosper and the ineffective are likely to disappear. Natural contingencies simply work that way. Producing results is a function of your understanding the true determinants of behavior.

Consider the problems facing our society today, it is apparent that most are behavioral. Imagine for a moment that you had complete and perfect knowledge of psychology. What problems could you solve? What employment could you get? How much money could you earn (e.g., stock broker, politician, manager, etc.)?

You will be able to attract more customers if you can show that your procedures actually work rather than simply trying to talk your customers into believing you accomplished something.

Your status with respect to other job candidates and fellow workers will most likely be based on your competence and ability to produce results. You will be more likely to be upwardly mobile if your procedures work better than your colleague's procedures.

Sooner or later you will be held accountable for what you do. Performance evaluations are becoming a fact of life. Your only security will be to have done what has the best possible evidence supporting it, proven in the most objective way possible. Layoffs never start with the most competent and productive workers.

# IV. Conceptual Precursor: "Truth" and "Understanding"

This entire manuscript can be said to be defining the meaning of the terms "truth" and "understanding." Said from a different perspective, it take the entire manuscript to define the terms truth and understanding in a way that minimizes confusion. Try not to blur your preconceived meaning of those terms with the definition used in the text.

It is very cumbersome to trot out twenty pages of text every time the speaker wants to specify what is generally meant by true. such as the fact that ten additional people adding up a column of numbers will get the same answer if the first one was correct or true. It is also nearly impossible to comprehend text with twenty pages of specifications every three sentences. The fine print and disclaimers would obscure the big picture for all but the highly trained. The present text is not written for the highly trained. The terms "truth' and "understanding" carry a great deal of undesirable baggage and are typically never used in professional discourse. In fact, they are all but forbidden. Those terms do however serve as excellent scaffolding to allow a beginner to develop the ability to sort out the events and words they are exposed to. The dilemma facing this text was to: 1) develop totally new terms and specify exactly what the terms referred to, and exactly what was excluded; then to specify how those terms were similar and dissimilar to the words truth and understanding. Thereby, having to develop the definitions for those common terms anyhow, or 2) to use the two existing terms: truth and understanding that are roughly correct and are quite correct in many ways, and then to enumerate what is reasonably included and excluded from their meaningful definitions.

Sometimes authors taking this latter approach say that truth is spelled with a small "t" rather than a capital "T." This is an attempt to make clear the issues explained throughout this text. What you label the sets labeled truth and understanding in this text after you graduate is irrelevant. It is the boundary of those concepts, what is included, and excluded and the rationale for their inclusion and exclusion that is important. The terms are scaffolding. It is unlikely that you will communicate to anyone simply by invoking these terms (or any other). Those that do not understand science will need many many hours of discussion, not two words. Those that do understand science will not be convinced simply because you raise those two words as a shibboleth.

# V. Understanding the Truth is What it Means to Know What You're Doing

The third step in lifting our onus is to determine the essential elements underlying all the skills or abilities that are labeled "knowing what you're doing." In general, the elements of "knowing what you're doing" can be grouped into two rough classes. In everyday language, those classes are labeled: "truth" and "understanding."

#### A. Demand What is Labeled "Truth"

You must have good evidence that things are true before you believe in them and that is not as simple as it sounds. 1) Unfortunately, truth is not necessarily obvious, what you like, nor the easiest. 2) Neither is common sense an acceptable arbiter of reality. Common sense can be as dangerous as helpful. Common sense is the "intellectual" force underlying adages, horoscopes, and the burning of witches. They can only be misconstrued into some caricature of truth in retrospect. Often they are true only in the sense that they predict everything, for example "opportunity knocks once," and "it's never too late." One or the other is certainly true on any one occasion. The need is to know in advance not after the fact when it is too late. 3) That your mother, teacher, or best friend believes something or supports your view does not make it true either. Everyone, including a psychopathic murderer, has a mother, a best friend and a dog that believes in them. 4) The fact that something is popularly known is also no reason to believe in it. Everything that is now known to be wrong was once accepted by people in the street. 5) Knowing or feeling that you're right is of no help. Even though most people do believe that they can be wrong, few people ever believe that they are wrong "this" time. Most people can be talked into believing a nonsensical theory, and most people fall for trick personality tests.

Your task is to set up a judicial system which will correctly judge the truth or falsity of issues. For this judicial system to be successful, it is necessary for you to accept that your "inner ability to understand people and recognize the truth" could be the problem rather than the solution. The solution to this difficult challenge is to determine what in the past has been shown to produce correct solutions as opposed to procedures which only produced strong emotional commitment but little in the way of enduring truth. Some things can be taken as evidence, other things are only conjecture, and are inadmissible. Your choice is essentially the same as that faced by society: rule by law; based on fact, and truth - or rule by lynch mob; based on popularity and what seems right at the time.

Truth comes no easier to psychology than to society, and for the same reason: it's easier and more fun to do things by your heart and intuition than by your head. Let's face it, people are convinced that they are right while they're lynching someone. They also feel that a court hearing is an unnecessary delay and hardship which gets in the way. Lynchings require no homework and have no prerequisite and are therefore popular among people who care more about how they feel about something than the facts.

We must be more concerned about truly understanding real facts than what we feel is the truth. We as psychologists have a great deal of power over people's lives. However, we cannot give ourselves the right to "lynch" our patients or readers just because they trust in us, they are unlikely to complain, and we earn a good living at it.

#### 1. Actual Definition or Meaning of "Truth"

There must be rules to screen-out knowing-that-you're-right, opinion, bias and conjecture from the truth. What makes something true? In simple terms, truth is an accurate description of something that is real. If three people tell you three different combinations to a safe, the one that works is the truth. It means that the information has passed a reality test. You already test perceptual information. You would look to see if a big rabbit were following Elwood Dowd around. You would reality test. If you didn't test to confirm that things were real you would be what is meant by crazy. You must learn to test verbal and abstract information in the same way - for the same reason. The importance of getting to the truth is obvious if you imagine a court room where all things were accepted as evidence and you were on trial, and the prosecutor hated your family and your ethnic origins. You could be lynched by the system. If the judge and jury did not test the reality of the information, you would have the same fate as a patient of an unscientific psychotherapist.

The problem is that truth is not always obvious. The fact is, without deliberate and careful thinking we are no more intrinsically objective or intelligent than people we ridicule for their bias or stupidity. Often, when we attempt to understand why someone else does something we simply substitute what our own reason would have been if we were to have done it. Each of us can remember a painful incident when someone has made that error when they tried to understand our motivation. When we infer our own reasons into other people or animals we can be very wrong. Contrary to some popular misconceptions, the discipline of psychology has more to offer you than rhetorical self serving tricks to convince people you really helped them, or that any problems which resulted were not really caused by the therapy.

The following principles have been very useful in separating truth from fiction.

#### a. Empirical

Sense data is the final arbiter of reality. Things are real because we can experience them not because we can imagine them or because we like them. We cannot claim that a space man did "it," and then when no space man is to be found, claim that it must therefore be an invisible space man. We cannot claim that an overactive ego caused the problem and then claim that it is an invisible overactive ego, detectable only by properly trained psychotherapists, of whom we are one and the questioner is not. If we wish to claim that something we cannot experience is real then the burden is on us to prove it to a skeptical audience; that is only fair. That we can prove it to ourselves, our friends, and our students is taken for granted.

#### b. Reliable

Things are real or true if a second look confirms their existence. If we add a column of numbers twice, and get the same answer; then the answer is likely to be correct. Reliability and how to maximize it is treated in much greater detail in Chapter 10.

### c. Multiple Converging Evidence

The more evidence from the wider a variety of sources, the more believable. If the police find a finger print the same as yours at a murder scene, maybe it means you are guilty of murder, maybe it doesn't. However, if the police also find your wallet there, and the murder weapon in your house, and the tire tracks of your car at the murder scene, and the victim's jewelry at your house, and your teeth marks on the victim's throat, and a VCR tape of the murder with you in the starring role - well, then you're in trouble. (Unless you have a very good lawyer, of course. This is where the analogy breaks down; law and science play by very different rules.)

In science multiple converging evidence has two aspects: 1) multiple measures of different types all indicating the same fact, and 2) an explanatory context which is very general with many cross validating findings in the theoretical network.

#### d. Consensually Validated

If several observers who abide by the "rules" of science all agree concerning an event then it is probably true. It is reliable, it is objective. If only one person observes something and others do not observe the same thing then it is subjective. Just as you believe that the true sum of a column of numbers is the one that both you and others have obtained, so does science depend on consensual support. This criterion avoids the problem of considering a dream or a drug induced hallucination a fact. For this reason it may be the most important criterion. If a theory precludes consensually validatable statements then it is metaphysics not science. This criterion works especially well if the observers are widely separated with respect to theoretical orientation, time, etc. Oddly enough, complete agreement is not necessary. You only need to agree over the issues under discussion and to whatever extent is necessary for the discussion to proceed. If you want to know if your group can pay for the dinner you need not argue over whether you have \$105.75 or \$107.21 between you when the bill is only \$25.00. It is an entirely different question however if the bill is \$106.00.

#### e. Operationally/Functionally Defined

If we are to communicate to others, or if they are to communicate to us, we both must be able to correctly point to the same thing that is being talked about. The agreed to definitions cannot miss anything, nor can they add anything that isn't there. The boundary of the set separating the positive instances from the negative instances must be explicit.

An illustration of the importance of operationalization is the fact that most disagreements can be resolved by simply checking that both parties agree to the meaning of the words. Are the people talking at one another or are they communicating? A second example pivots on the meaning of intelligence. It's wrong to believe intelligence is something indefinable and more than what an IQ test measures. This can be quickly illustrated. If you took a test and scored IQ = 100 and the psychometrician said your IQ was actually 150 you would admire his depth of knowledge. But what if you took an IQ test, scored IQ = 150, and the psychometrician said you actually have an IQ of only 90. You would then immediately ask what the mystery component was and how it was measured. You would demand that that factor be explicitly part of the definition of IQ. The psychometrician would say it was nonempirical good clinical judgment and unmeasurable and that you do not get the job. You would be right. If you think that something exists which does not show up in the definition of a thing, you must ask yourself how you know it's there and how you are any different than a delusional patient. If you believe in a trait which is communicable; OK, specify it. If you think you have transcendental knowledge beyond anyone but your friends to understand, you are foolish and more than a small part of the problem.

A divergent illustration of the importance of operationalization is given by the Magna Carta and the Constitution. They were the operationalization of the power of government. They provided people with operationally defined rules, which in turn gave people "freedom." Both the government and the people were bound by the rules, neither could make things up to suit themselves. The king could not arbitrarily jail someone based on his regal judgment nor could he extend indefinitely a sentence for a small crime based on his regal judgment. If the society agreed that a crime was heinous, then the punishment was set to fit the crime as a matter of public record not as the whim of a single unaccountable individual. For the same reason society operationalized its rules, so must the field of psychology operationalize the meaning of good psychological health and when someone is ready for release. We must operationalize our theoretical constructs if both psychologists and patients are to prosper.

The concept of a thing, or the set defining a thing, must be correct. There are two ways of looking at this essential principle. The first is with respect to what actually exists (ontological validity). The second refers to the degree to which our definition actually corresponds to what we are pointing to (the thing's referent). Ultimately, these two issues are the same thing, but it is pedagogically easier to discuss them separately. An example of how they could be considered different is given by the following example: when we talk of unicorns the issue is: do they exist. When we talk of pink elephants, the issue could be said to be only the lack of correspondence between our stated color and the color of the real elephant. But it could also be said that pink elephants do not exist.

To be correctly defined, the definition must correctly capture the nature of the thing, the definition must be testable, the errors between speakers or between the term and nature must be minimal, and the terms must be coherently integrated into some conceptual system or paradigm. The demand for integration is what provides generality to findings and provides the explanatory power of science. The fine details of these issues will be presented in a later section.

### i. Ontological Validity

Entities are best defined by the functional relationships defining the entity and the operations used to prove they exist or not. A good definition or concept maps correctly onto nature and results in no discrepancies of correspondence. Things cannot be said to exist outside the impact they have on sensation (direct measures) or the impact on other things (indirect measures). If your idea of the correct concept of a thing exceeds its operational/functional definition, the burden of proof or burden of communication is on you to prove, explain, and communicate the difference. You cannot have unwritten clauses in a contract and expect people to agree to "what they signed." You cannot have unspecified meanings to words and expect people to agree to "the meaning of the word" when you change that meaning from what they originally agreed to.

You can easily accept the value of operational/functional definitions if you commit yourself to a psychiatric hospital and then try to get out. Without operational/functional definitions of "sanity" and "insight into your problem" your freedom would depend on the whim of your ward supervisor. Imagine that the person you cannot avoid arguing with every time you see them was your therapist. Could you get out of the institution? How would you cope with Nurse Ratched in "One Flew Over the Cuckoo's Nest?" Nurse Ratched believed in her clinical judgment or intuition and allowed them to govern her behavior. She in effect allowed her personal feelings to establish the reality in which the patients had to survive. She was a lynch-mob psychologist rather than a scientific psychologist. There were no operationally defined boundaries to her concepts. She could pick and choose meanings to suit her purpose and they varied from patient to patient.

#### ii. Correspondence with Referent



The meaning of a word is intended to include some elements and exclude others. In the case illustrated in the above figure, 1 and 2 are correctly included as part of the referent. 3 and 4 are correctly excluded as not part of the referent. But, what about 5, 6 and 7 which dotted line is the true boundary of the set? A good definition is unambiguous with respect to what is included and what is not. A good definition or concept must have an explicit boundary. The concept of a horse is false if it includes the saddle or fails to include four legs; it is false if it includes speaking English or fails to include galloping.

#### iii. Conceptual Fine Point: Nominalism Versus Essentialism

In actuality, we define or name things by convention. "Chair" is defined by our community as "this example" and "not this example" and "this kind of thing" and "not these kinds of things," etc. There is no giver of meaning- a dictionary writer in the sky, so to speak. There is no a priori meaning of words or boundaries of concepts. There is no platonic ideal "chair" that exists independent of humans. This view (conceptualization for language) is labeled nominalism (meaning from the convention of a group) as opposed to essentialism (meaning from intrinsic essence) (Popper). Nominalism is the realization that it is not that concepts or words must correspond to their idealized referent, but rather that the language communities grouping of empirical referents actually define the concept or word. No person is, was, or ever could be in a position to compare the ideal to the referents and judge the accuracy of usage. There is no ideal set. There is nothing more than the referents agreed to by the language community. Words and referents could not exist before humans.

However, the connection between words and their referents is of very real importance. Our paradigm is defined in part by how we define things. If anything can be defined in any way and no two observers need agree, progress ceases. If the definitions are wrong and the paradigm does not permit change, then a new, better paradigm is warranted. We can define the "essence" of a thing (i.e., our paradigm defines the word this way) rather than the essence (i.e., nature was created with this word meaning this thing). Similarly, we can talk about "reality" (i.e., all those predictions humans experience) rather than reality (what something is beyond human experience). Reality is that construct that no further information changes. If there were a reality which transcends our ability to sense it, how would we know that which we cannot sense, how would we be able to evaluate the discrepancy independently of our ability to sense it, the ability of others to sense it, or the communities ability to sense it over time.

### f. Coda: Science, Truth, and Belief

The following figure illustrates an essential aspect of the present meaning of the word truth. There are things which have the characteristics specified in the previous sections (empirical, reliable, etc.). We call these things true in everyday language. We also call these things scientifically established facts. People who deal with things in the inner circle in the following figure are called scientists. Truth is nothing more than science. Science is nothing more than what we mean by the term truth. Science is NOT a subset of the truth.

Rather than to start with the notion of truth and then provide science as a subset, this manuscript starts with the notion of empirical, reliable evidence with multiple converging support which is operationally/functionally defined and has consensual validation and asks what is beyond. If someone wants to offer something else as a truth, it must have been proven in a way consistent with what people mean by truth. Truth does not mean anything anybody wants it to mean. Anyone wanting to extend the meaning of truth, to something beyond what science has already substantiated must explain to us what they have in mind. The irony is that by the rules embedded in the everyday meaning of the word truth, we would simply expand the number of scientifically established elements not increase the difference between science and truth.



We cannot simply assert that some position may eventually be true and therefore give it some special status. In the first place we cannot know the future. Secondly, that view would suggest that we no longer have to worry about the accuracy of what we do today. The allure of reifying a future truth that is beyond what we know today is that it seems to give the speaker the right or authority to believe anything they want. By simply asserting "this may be right eventually," that view comes to have a footing equal to any currently "proven" view. By similar logic, any finding could be rejected regardless of the evidence supporting it by simply asserting that sometimes scientific positions change. These self-serving tricks are impediments to progress. Truth resides in the present, all else is speculation.

The other side of this complex issue is that truth does change and what is true today may not be true tomorrow. The process underlying the dynamic nature of science that enables science to advance is relatively recondite and is detailed in a subsequent section. In sum, what has been established as true is accepted as the best, and therefore the only acceptable estimate of reality until there is overwhelming support for a new position. At that point, truth changes.

### B. Have What is Labeled "Understanding"

We must understand how, when, and why things work the way they do. It is not sufficient to only be able to redescribe a demonstration we once saw. You must comprehend the controlling factors underlying the functional relationships involved. You will be unable to predict what will happen in other situations and you will be unable to control behavior in alternate situations if you do not understand what makes behavior work the way it does. By returning to the "see the dolphin" metaphor, the point could be illustrated. For example, suppose a person came to be able to see the various images that were imbedded in of a wide variety of pictures; then that person would also be likely to be able to find and see the new images in a wide variety of completely novel pictures; whereas a person only memorizing that a particular picture contains a dolphin would be unable to identify which images are in which new and different pictures.

You must understand the set of various unifying principles which underlie various phenomena and how to identify them if you are to be successful. The object is not to memorize that in this situation you do this procedure (the picture with squiggly lines has a dolphin in it) and not ever really understand what's going on.

Another example of the difference between a person really seeing something and a person only giving the appearance of seeing something is the situation in which someone, who after being told that the picture has a dolphin in it, simply extemporizes everything they can remember about dolphins. Clearly, many things they say are generally correct. The problem is they still don't see the dolphin and will make a great many mistakes by taking actions based on their fabrications. Imagine a surgeon cutting on your brain with the same level of understanding.

Being able to do nothing more than follow directions, or memorize an answer to a specific case is well illustrated by the fable of the child sent shopping. Being sent to get butter he carried it home in his hand, a reasonable thing if you don't understand the properties of butter and hot summer days. It melted. His mother chastised him telling him he should have wrapped it in wet leaves. She then sent him to fetch a loaf of bread. He wrapped it in wet leaves. The story goes on for many trips. The boy always doing what he learned by rote, never understanding the principles underlying why he was doing what he was doing. As a result he always did the right thing in the wrong specific case.

### 1. Actual Definition or Meaning of "Understanding"

Understanding is like seeing the image in a random-dot stereogram. In fact, it is the same physiological process. Memorizing words from a lecture or the name of an image in a stereogram misses the point. That is NOT what it is to "see" something; that is the appearance, NOT the substance. If you actually see the image in the stereogram, you can specify things about the image that you were never told. If you understand some process, you can make predictions that you were never told. To the extent that simply repeating words diverts attention from doing what is necessary to actually see the point or image, then learning the words of "the answer" is destructive. What you are after is the skill to come to see the image or process.

The impact that the requirement for understanding has on the scientific endeavor is that it focuses attention on what is the same about a variety of behaviors, rather than on what is different about those behaviors. This is much like a chemist focusing on the common properties of various substances rather than being stupefied by the superficial differences in those substances. The important task is to see through differences to the common underlying principles.

To understand is to be able to arrive at solutions for problems no one before

has ever encountered and for which neither a study guide nor answer sheet is available. If you understand a phenomenon you can use that information in new situations. Understanding begins with having a hunch, a rule, or a theory which specifies why things are happening the way they are and which specifies how the rules are to be modified so that they work in changed situations. Understanding provides you with the ability to be fruitful or productive because you can predict.

The classical statement of someone who does not understand a process is "it works in theory, but not in the real world." This means that that person can redescribe a classroom demonstration they once saw ("there is a dolphin in the picture"). But much to their amazement, that didn't help them in their current situation (because the details of the solutions are different than the one they memorized in graduate school). The problem is that they never understood why the phenomenon happened and what makes it happen or not happen in changed situations. (They never actually "saw" the dolphin in the picture; they only knew to repeat words. When presented with a picture they had never before seen, that happened to have a lion in it; they said "there is a dolphin in the picture" and they were obviously wrong!) They did not understand the organizing principle or paradigm (discussed in Chapter 2 Section IX.).

An additional problem with their lack of understanding is that it is also very likely that over time their memory slowly shifted to something completely different from the original underlying machinery. If you memorize nonsense syllables or disconnected facts without any underlying pattern you will slowly lose track of what goes where. For example, if I told you the following series of letters O T T F F S S E N T E T T F F S S E N was important; even if you believed me, correctly remembering them for ten years would be difficult unless you understood that the underlying principle was that the letters were the first letters of the numbers from 1 to 19. It is easier to remember well understood processes because there are multiple examples that all work the same way and virtually none that contradict it.

The following capability when taken together define what it is to understand.

#### a. Describe

Given a language, a minimal understanding is exhibited by a description or a specification of which elements are contained in the set and which are not.

#### b. Predict

The importance of this aspect of science cannot be overestimated. It is one of the most important products of science. To predict is to specify what will happen in a new situation by virtue of understanding a rule which applies in a known situation; knowing how the unknown situation relates to the known situation; and knowing how to correct the rule if differences exist between the situations. For example, simply knowing that the pigeon pecked the blue light more slowly doesn't help predict much. But, understanding that decreases in reinforcement rate typically reduce the rate of the supported behavior helps predict into a very large variety of situations for all life forms.

### c. Control

If you understand a functional relationship then you have the opportunity to modify its causes, which in turn allows you to modulate it or make it occur or cease. If you do not understand what makes a phenomenon work you will be unable to control it. It will occur or not occur irrespective of your efforts.

## d. Synthesize

If you understand what makes a phenomenon work, not only will you be able to create or abolish it as you desire, you will also be able to produce completely new variations to suit your needs. You will be able to produce a behavior in an organism that previously did not occur.

## e. Explain

To explain is to integrate the phenomena within a larger context or paradigm. An explanation provides general rules in order to more easily describe, make predictions, control, and synthesize new phenomena and to communicate this ability to other people. A proper explanation must be based on the criterion specified under truth: it must explicitly and unambiguously specify its elements, it must be testable or capable of being validated, it must be nontautological and it must minimize errors. These factors are discussed in more detail in the chapter on explanation.

## f. Coda: Something Can Be True But Not Understood

As the following figure illustrates, there can exist things that are true but that are not yet understood. Science could, in fact, be seen as that activity which strives to expand the set of understanding to include everything that is true



# VI. Overview of the Obligation You Acknowledge

If you want to "do unto others as you would have them do unto you" and if you want to be successful at your job, then you should demand empirical, reliable measures, multiple converging evidence and consensual validation with operational/functional definitions for its elements and be able to describe, predict, control, synthesize and explain the natural world.

# VII. Label for Activity That Makes You Ethical and Prosperous

The fourth step in building a logical foundation for your practice of psychology is to know as much about behavior, and to do those activities which are known to produce, what people have labeled "truth" and "understanding" because that will give you what you want most (i.e., being ethical and prosperous).

Science is the label for the human activity that produces what people mean by "truth" and "understanding," therefore, scientific psychology gives you the right to claim that you are ethical and the confidence to believe that you will be successful at your job. Note that the focus of science is not on doing those things that make you ethical and prosperous, rather its exclusive focus is on reliability and prediction and all the rest. When you wish to produce a product, then you do those activities which are known to produce that outcome. When you have a particular goal or destination in mind, you take the path that is known to go in that direction. If you want to be ethical and prosperous, then be "scientific." Few people would articulate their onus as "I want to be empirical." But, most would say that they want to be ethical, and then go on to say that to be ethical is to base their practice of psychology on the truth; and further, that the "truth" is that which can be seen or felt in person, which is what is meant by being empirical.

# VIII. Conceptual Follow-Up: Truth, Understanding, Reality, and Pragmatism

The present manuscript logically followed the ramifications of what most psychologists consider important in their lives (i.e., being ethical and prosperous). The vocabulary accepted was that of everyday usage because it's essential to show that science is the best expression of what's at the heart of most people's beliefs, not something that is independent of them. Subsequently, operational definitions of these ideas were provided because discrepancies in the degree to which different people have thought through those issues could be consequential. Additionally, the use of common language was deemed reasonable because the label for sets was seen as secondary to the understanding of what was in and not in those sets.

An unassailable and orthodox philosophical dialectic could have been fastidiously expounded but at the cost of expanding the treatment to several thousand pages thus burying its relevance to psychology. Many lifetimes could be (and have been) spent arguing philosophical fine points such as "maybe only the destruction of the earth and all humans will serve the ultimate good" or "what is real"? or what is a definition of truth that everyone in the past, present, and future would accept. The present approach is a compromise; sufficient didactic for the vast majority of student readers but no real attempt to convince the diehard metaphysical sophists.

This general pragmatic approach is well illustrated by the science truth and belief figure. There simply is no practical difference in "truth" and truth, "understood" and understood; and "reality" and reality.

# IX. Summary

## A. Scientific Psychology Satisfies Your Onus 1. To Be Ethical

Only to the degree that the practice of psychology rests on understanding nature is it ethical. A scientific basis is what makes psychology something more than money grubbing, self-serving hucksters, because the product of science is what is what we mean when we say truth and understanding.

## 2. To Be Prosperous

Only to the degree that the practice of psychology rests on truth and understanding will its practitioners have good reason to predict that they will be successful and secure. Your job success will most probably be based on your possessing skills or capabilities that are more productive than your competitors. Additionally, it will depend on your ability to demonstrate the actual effectiveness of what you do. Science has by far the best track record for providing them both, because science is the activity which produces those very things.

## B. Graphic Illustrating the Logic Underlying the Choice of Science

This chapter can be seen as having been the elaboration of what it actually means to say you want to be ethical and prosperous. The following figure illustrates the logic underlying the rationale for a reliance on science in psychology. Both the set names and their operational definitions are provided. Science produces that which produces being ethical and prosperous. Given the fact that the boundary of a set is essential and its label is arbitrary, the more fastidious way of stating the issue is "that which is labeled science produces that which is labeled ethical and that which is labeled prosperous."

# What are you willing to work hard for in order to attain?



All this is often simplified to: "Psychology must be scientific." The underlying logic being that the scientific method is the instantiation of the process which results in people being ethical and prosperous.