DUALISM AND REDUCTIONISM: THE ELEPHANT IN THE PSYCH LAB AND CLINIC

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About one-half century following turmoil in physics, a similar dispute occurred in psychology over what concepts are acceptable. In all disciplines concepts should be measurable in an objective time and space. Their usefulness depended upon how well they portended or explained future events. Logical errors of dualism occurred whenever events metaphysical, i.e., unobservable, were linked by cause to events observable. Logical errors of reductionism occurred when events described with molecular constructs were seen as basic to or causing events described in more molar terms.

Psychology is different from the other disciplines of science in that it not only has a specialized reporting language as part of the scientific end product but also the full spectrum of language as part of the initial subject matter. Psychology is the same as the other disciplines of science in that the investigators have a fraction of their observation where they can reach consensual agreement with fellow observers and a portion that is privy only to themselves as individuals. This portion of each person's private experience cannot be breeched. If an observer attempts to share with another his or her private world, it immediately becomes verbal report. That portion not shared from the other may be correctly guessed, fraudulently guessed, or remaining unknown. From these fractions come the majority of logical errors in science.

Just prior to the 20th century, physicists were in transition and turmoil. Arguments were made about what concepts were acceptable. One issue was whether 'unobservables' were valid. By definition an 'unobservable' had no weight and occupied no space in a three-dimensional field of study.

In a few decades the science of psychology was also in turmoil. The very definition of psychology – the study of consciousness – was being challenged. The term was not denotable in objective time and space. Out of this period of transition came issues of dualism and reductionism. They are still poorly recognized and not resolved.

Although the controversy of the physicists might appear different from the later turmoil in psychology, the two were dealing with highly similar problems: to advance science with propositions that allow new ideas and their replication. The purpose of this paper is to shed light on these issues, to discuss why they are important, and to argue why they should be resolved.

1860

This story of dualism and reductionism might begin with the first international meeting of physicists in Karlsruhe, Germany, in 1860 (Pais, 1982, pp. 1-7; 1991, pp 77-88). A total of 126 physicists and chemists gathered from 12 countries. The agenda included polarized views already extant. Does an atom exist in time and space with a weight and volume? Is a molecule identical to an atom? Are physical and chemical molecules the same?

If not already evident, the participants became aware of a schism between the 'Old Guard' and the 'Young Turks.' The Old Guard held that the subject matter of physics consisted solely of what existed in time and space and could be shown to have weight and volume. Any concept that failed to meet these criteria was shameful and to be abandoned.[1]

[1] Actually, the 'Old Guard' members were overlooking the fact that time, space, and 'external reality' are not directly observable sense organ data. Instead they are constructions after having observed such data. Once construed

The Young Turks, on the other hand, held the view that some substances were too small to be seen or otherwise sensed. The requirement of observability was waived. They also assumed these particles could not be further subdivided. Following Greek etymology the unit particles were designated as *atoms* ('a-,' without '-tom,' cut.). The Young Turks were split on whether the effective 'atom' would or would not eventually be found to have substance.

Such descriptions of the atom's characteristics made clear that at least some of them felt the atom was not absolutely unobservable. It was simply beyond the powers of human perception. The important issue to them was that it made no difference.

The debate at Karlsruhe had implications well beyond whether an atom existed and whether it should be banned from science. What was going on in Karlsruhe had implications for psychology and the other branches of science as well.

The Old Guard at the meeting, both physicists and chemists, saw the Young Turks as arrogant and unfounded in their formulations. They saw atomic theory as a passing fad, useless, embarrassing to physics, and in need of immediate discard. After all, they argued, an atom could not be located in time and space. It had neither measurable weight nor volume.[2] Especially in the last decade of the 19th century the journals were both personal and vitriolic in their railing at the young atomic theorists. One of them, the prolific Ludwig Boltzmann, committed suicide, allegedly in response to the attacks.[3]

As we now know, the atomic constructs – the linguistic tools – won the day. Atomic theory predicted many valid observable events. Many people, scientists and others, have now attached confidence to atomic theory. However, as with all science, the affirmation of the consequence does not affirm the antecedent theory as true.

Upon closer scrutiny the 1860 controversy was not solely about observability. Granted, both groups held observing as the bedrock of science. (Sci-, to observe.) Looking is the first step to advance knowledge (See Berra, 1998.). And it is true that the Old Guard alone saw unobservable to be unacceptable. What is important is why the Young Turks felt otherwise.

Emerging in the background was the issue that had been addressed in Heidelberg by Helmholtz and his student Wundt. They had been challenging thee preexisting 'switchboard' theory of human perception wherein the person (call it brain if you wish) yields an output that matches the input. They were examining evidence that indicated that the person processed the input so that the output did not match. If so, then each observing physicist would have his/her own representation of the input that was observed. A constant and absolute reality could be challenged.

Even more important, a new way of thinking was emerging. How and when assumptions are imposed makes a difference. The Old Guard assumed a pre-existing universe of absolute and unchanging reality. This reality was prior to the observing (Mach, 1897). That is, this domain was separate from the physicist, the human investigator. The observed existed prior and independent of the observer. The role of the physicist was to come along and discover what was already there. As already noted, things unobservable, like atoms, were not a part of this absolute truth.

The Machian view is rejected in this paper. Although alternative constructions are always possible, and the Old Guard Machian view is a traditional one, it appears absurd to this author to assume 'reality constructions' to occur prior to having sensory input to allow one to make these reality attributions. To assert a preexisting reality would require that it become known initially by some means other than the senses.

Where one places an assumption determines how the physicist views his task. If one assumes that the subject matter of physics is the interaction of the physicist (observer) with the time and space field, then the task of the physicist is to

after the fact, then most scientists gratuitously attribute such to be preexisting (Cromwell, 2010, p. 309-346). Like Einstein (1916/1921), the space and time formulated in human infancy are found not to be independent of each other.

[2] It is worth noting that the major blow to the Old Guard came in one of Einstein's 1905 papers, wherein he demonstrated how to calculate the atomic weight of an atom. While this particular article is viewed now as support for Einstein's theory, it was viewed at the time as support for the young atomic theorists. This was by intent as he knew well of the controversy.

[3] Boltzmann probably already had bipolar pathology.

observe and to and to remove human error in the observations.

Another approach is to assume the field of study involves the interaction among physical events but excluding the observer as part of the area of study. All such shared public record is treated as absolute lawfulness. Such would be called theoretical physics.

If, by contrast, the role of the physicist is to develop his own construction based upon his own observations and not make assumptions about prior existing reality, then the role of the physicist – and of all scientists – is to deal with multiple perceptions, all to be collapsed into the best and most probable estimate. Such would be called experimental physics

Such a science as the latter represents a shared human creation, one step removed from the actual events being observed, measured, and analyzed. They allow the observing physicists to 'act as if' this is the ultimate truth of the universe. In other words, what physicists come to regard as the absolute truth of the universe is merely a post hoc construction.

Now, to look at the view of the Young Turks, at least some of them, a new kind of thought process is emerging. It can be called the anabolic/analytic cycle of hypothesis building.[4] Two components come together as a cycle. One component, the anabolic one, links an operationally defined event (x) together with (H) a hypothetical unobservable construct (such as an atom). Thus, xH. The second component links the hypothetical H with an outcome or implication (y) which is observable and measurable. Thus, Hy. If these are combined into a cycle, then xHy. The xH may introduce a new label but no testable hypothesis. Likewise with the Hy. However the xy may create a testable hypothesis that might not have been foreseen if not for the inclusion of H. The role of the anabolic/analytic cycle will be evident later on as the science of psychology is addressed.

As prior to 1860, when Old Guard thinking was dominant, the certitude of a scientific construct depended primarily upon the clarity of definition (as a substance or event existing in time and space and with weight and volume). This was the x side of the xH hypothetical construct. With the infusion of Young Turk thinking, an increasing emphasis placed upon utility (Bergman, 1951, 1956), especially upon anticipation. This was the y side of the xHy construct. Accordingly, the construct tended to be named after the y (or consequent) side (e.g., antidepressant).

Since early science was not mindful of the relationships of the anabolic/analytic, e.g. XHy in many constructs turned out to be 'unaffordable.' In present or forever.

The state of scientific knowledge moved ahead regardless of these alleged flaws. In fact, the fields of physics and then biology have prospered particularly.

The advances we have seen in knowledge might have been greater had the rules of scientific thinking, doing, and recording been better understood and followed. It is possible that we are still in the dark ages and what we now regard as state of the art may one day be viewed as primitive. It is reasonable to conclude that the best is yet to come.

PSYCHOLOGY

Psychology was early defined as the division of science that dealt with *consciousness*. Turmoil emerged with this definition. Some viewed it as a metaphysical concept outside the realm of science. Some viewed it as having 'meaning plus' that was outside the realm of observability. Some viewed it as not referring to primary events (input to senses) but as a superordinal construction of such inputs. It is no surprise that this turmoil followed soon after that which occurred in physics.

The allocation of subjective experience and its report came as another advance in thinking. Earlier thinking associated subjective experience, mental events, etc. as in the sole domain of psychology, while objective data was in the domain of the psychical sciences. Now it is more fully recognized that both the psychological and the physical utilize subjective data (events that one observer cannot share with his fellows but one can share a reported description of the event), whereas other modes of description assume that the event being described is external to both observers. For example, the sensory experience of blue can easily reach consensual agree-

[4] Also to be associated later with the creativity cycle (Kelly, 1955).

ment, but no evidence exists that one person's blue is the same as another person's blue.

WILLIAM JAMES

William James (1890) is perhaps best known for defining psychology as the study of input of ongoing experience. What is perhaps more important is his view of what happens after this ongoing input has been received. In short, he held that the individual does the sorting, packaging, and ticketing of this input. This is in contrast to the Old Guard Machian view that the sorting is already there to be discovered. James' view is that an analog (continuous) input leads to a digital product when processed by the receiving organism. It is packaged into the respective constructs in our individual construct systems. Finally, it links forward to some future (yet to happen) event. Instead of ongoing, the input is now parsed into units. With these units [called elements in Kelly's (1955) theory] various hierarchies of constructs are built. Various guiding propositions like determinism and symmetric vs. asymmetric linkages are built. James viewed these guidelines as part of the construer, not the construed. In other words, they are not inherent in the subject matter but in the observer of the subject matter. It is difficult for a person to imagine a universe without rules of determinism, rules for taking action, and stop commands. The reason is that, before the input, they do not exist. Each individual has to build his own.

Some readers find difficult the metaphor of the three umpires discussing how they call balls and strikes. One umpire says, "I call them the way they are." This suggests the Old Guard Machian assumptions. A second umpire says, "I call them the way I see them." This suggests the role of individual perception. The third umpire says, "They ain't nothing until I call them." This suggests the James notion of the individual's acting upon and processing the input.

In the last decade of his life James (1904) modified his view. Behavior rather than consciousness (ongoing experience), he decided, was the subject matter of psychology. This was an early recognition of mind-body dualism. The mind (in a domain outside sensory input and measurement) was unacceptable as an antecedent to bodily activity. Instead all of psychological science was defined within the perimeter of time and space. All hypotheses could be testable. Knowledge could be more easily advanced.

JOHN B. WATSON

In 1913 Watson published his 'Behaviorist Manifesto.' It firmly asserted behavior as the subject matter of psychology. The study of behavior was to be organized into laws of stimulus (S) to response (R), response to response, and the relationships of S-R laws to other variables. Watson associated consciousness with the mind. Mind was metaphysical and nonexistent. To have mind as a causal factor to behavior was nonscientific. Unobservables were causing observables.

Arriving for graduate school in Chicago from a dysfunctional family in a lower socioeconomic setting, Watson already had personal characteristics that affected his performance. He found himself unable to conform to the graduate student tradition of being each other's participant subject on projects. Unable to introspect with 'shades of gray' judgments, he spoke in 'all or none' judgements. Also, he claimed not to understand John Dewey.

With all this, Watson gravitated to the biology department. There he engaged in animal, and later infant, research. His study of introspection and human language decreased.

In Watson's subsequent theory, mind as antecedent was discarded in favor of brain. The ultimate basis of psychology (1913; Pratt, 1939) resided in 'electron-proton aggregates' of the brain. Unobservables go around, and unobservables come around.

With the role of brain in defining psychology another issue is raised. Throughout science a trend had arisen for more molecular levels of explanation to be viewed as the cause. Thus physical chemistry became viewed as providing the ultimate explanation for biochemistry. Biochemistry became the ultimate explanation for physiology. Physiology became the ultimate for psychology. Psychology provided the fundamental explanation for sociology. Sociological concepts became requisite for political science and economics. This ladder of molecular bias became known as reductionism.

JACOB R. KANTOR

Among Watson's fellow graduate students was Jacob R. Kantor. Kantor created an alternate theory called interbehaviorism. Rather than being restrained to an S-R format, the subject matter of psychology was, like all science, in a field of time and space. The arbitrary fields chosen for psychology were those with interactions of the organism with objects and events within this objective field. The product of psychological science, after observing, measuring, recording, and analyzing, was the construction of the original subject matter. This would be the psychological level of explanation. In parallel, are other alternate levels of explanation. No priority or degree of truth existed among these levels.

The importance of Kantor's work was to warn against logical errors in attributing causality. First, the construction of the event does not cause the event. "Ze map does not cause ze territory," as the semanticists were often quoted. Second, one level of construction (e.g., molecular vs. molar) does not cause another.

It is now appropriate to define dualistic and reductionistic errors. *A dualistic error occurs when an event or phenomenon outside the realm of observability is proposed as the necessary antecedent or cause of another event (or set of events) within the realm of observability and measurement.* One such example is mind-body dualism. This is only one of many types. The mind-body dualisms are one of many types.

A reductionistic error occurs when a more molecular level of explanation is viewed as causing (being necessary antecedent for) a more molar level. The two levels may or may not be dualistic.

Kantor criticized Watson for having brain events, unobservable and unmeasurable, to have an antecedent or causal role for more molar levels. Kantor referred to these as *latent* or *Watsonian dualism.*

The dualistic and reductionistic errors have become so embedded in our scientific language that many people still believe that a natural break occurs between the physical/biological sciences and the social behavioral sciences. Citation indices and sometimes library holdings separate the two levels as if a natural seam divides them. Actually, they represent two arbitrary levels of explanation of the same set of time/space events. One level, the more molecular, has benefitted from greater study.

Yet another error got Kantor's attention. It was the error of assuming an event had only one correct interpretation. The solution later became known as constructive alternativism (Kelly, 1955).

Yet another philosophical error was one whose exposure was shared with the general semanticists (Korzybski,1990; *Hayakawa*, 1979, 1983; and later, Johnson, 1946). This error occurs when the definition of an event is said to cause the event. For example, if schizophrenia is, in part, defined by the presence of delusions, then one cannot say the delusions are causing the schizophrenia or that the schizophrenia is causing the delusions.[5]

Students entering psychology are usually already immersed in the dualistic common talk. "What's on your mind?" "Mind the gap." "I have half a mind to hit you." Many religions invoke mind and spirituality in their lexicons, but the rules for a different knowledge domain--oriented to faith rather than empirical proof—are irrelevant to rules and errors in science. In the classroom Kantor had the reputation of being the 'wise old owl' who would immediately flog a student the moment he betrayed the scientific language. Yet, during those years at Indiana University a student was not considered a psychologist until they had mastered the separation of a monistic system of language from a system that mixes dualistic and monistic sampled. ["If you think I believe in mind-body dualism, you are out of your behavior."].

In his writing Kantor failed to distinguish between a dualistic and a reductionistic error. Also, he did not distinguish clearly between a legitimate intervening variable (xHy) and a dualistic error. what was a genuine *reductionistic* error differs from a legitimate intervening or hypothet-

[5] Lurking just outside the perimeter of Kantor's curriculum were the logical errors in applying propositions from one knowledge domain to another. The knowledge domains of science and religion are generally accepted to have different major premises . One concerns empirical proof and the other concerns faith. One cannot take propositions from one logical domain and apply them to another. One cannot insert constructs from a hierarchy with premises of empirical proof into another hierarchy with premises of faith. or vice versa.

ical construct (See above; also, MacCorquodale & Meehl, 1948).[6]

JULIAN B. ROTTER

Rotter (1954) named three mentors who influenced his career: Alfred Adler, Kurt Lewin, and J. R. Kantor. Like Kantor, Rotter rejected dualistic formulations in his social learning theory. But also like Kantor, he failed to distinguish between dualism and reductionism. He rejected the idea that one level of description, like physiology, could cause another level. Rather than reductionism he called it dualism. Rotter was a leader in seeing that a subject matter of behavior took the clinician a step away from the ordinary working concepts as a client discusses subjective state. No longer can the client's introspections be regarded as first order subject matter. Yet Rotter was not to the point of admitting that the clinician – the therapist – is actually dealing with his/her own construct system as it subsumes the words and action actually expressed in the therapy room. Rotter proposed that the subject matter of the clinician is "the subjectively perceived time/space field of the client." Whether this provides a solution is arguable. What is indeed clear is that Rotter recognized the elephant that resided in the therapy room.

B. F. SKINNER

Skinner, more than any other psychologist, stripped his theory from dualism and reductionism. The Skinner approach has been known for the counting and graphing of objective observations of behavior. Skinnerian's group was and is known for the view that any result can be given in graph as well as narrative. They have not been known for subjective judgments. They have been known for identifying environmental reinforcers. Independent variables are often schedules and latencies. Dependent variables have been frequency and intensity of behavior. The theory can be applied to the measurement and modification of verbal behavior but without intrusion from faulty subjective assumptions.

One criticism has been that Skinner discarded the lima beans with their hulls. Rejected from Skinner's theory is the linguistic tool of hypothetical construct (intervening variable).

When Skinner joined the faculty of Indiana University Kantor was asked to introduce him for his first faculty address. Among the accolades given, Kantor noted that Skinner was the second person to discover that Watson's theory was dualistic.[7] Kantor clearly hinted himself as the first. Skinner was not whelmed at the notion of being second to anyone. The two did not speak to each other thereafter.

During my sophomore undergraduate year Skinner conducted the ceremony to induct a group of us into Psi Chi, the psychology honorary fraternity. During the proceedings, when Skinner came to recite the word 'mental,' he displayed an uncertain countenance. His graduate students joked with him about it afterwards.[8]

xHy

In direct contrast to Skinner's theory the xHy construct is a linguistic tool, bound before and after, giving the appearance of unobservability; nevertheless, anchored by an antecedent, xH, and a consequent Hy on the other side. They combine to create a monistic and highly useful construct for the advancement of knowledge.

A glimpse of the xHy was first noted here with the young atomic theorists in the 1860 in the first international meeting of physicists. Later the xHy was decomposed into the anabolic and analytic phases of hypothesis generation and testing.

Since the distinction between a dualistic and an xHy construct is often difficult, some examples are given. To place emphasis upon structure

[6] In this paper no distinction is made between a hypothetical construct and an intervening variable. MacCorquodale and Meehl (1948) suggested that the Tolman minimalist definition be used for the term intervening variable. In the current paper, where no implication of substance exists between the anabolic and analytic, no distinction is necessary. Many constructs, such as atom and gene, change in their status over the span of history.

[7] Personal communication, William S. Verplanck, March 1999.

[8] At the end of this year Harvard University recruited B. F. Skinner, William S. Verplanck, William K. Estes, W. O. Jenkins, and Leo Postman from the I.U. faculty.

rather than content, some highly deviant content will be used in some examples. Imagine the following:

A red sunset occurs. This means that the rain gods are angry. If the rain gods are angry, it will rain within a day.

Comment: This is a legitimate xHy. The red sunset, x, and the subsequent rain/not rain, y, afford a testable proposition. The H, angry rain gods, is an irrelevant prompter. The construct is not dualistic.

A red sunset occurs. This means that the rain gods are angry. If the rain gods are angry, you must pray to them. Change in weather or lack of it cannot be determined.

Comment: Although the x anchor, red sunset, allows a publically shared observation, the consequent anchor point, y, does not. The construct is dualistic and resides outside the realm of science.

The barometer reading falls. This means that a weather front has arrived. If so, rain within the day is expected.

Comment: The antecedent anchor x (barometer reading) is observable. The consequent, y, likelihood of rain, is verifiable by observation. If 'weather front' cannot be defined by other means than x, then it is an xHy. It is a hypothetical construct and is not dualistic. If other observable markers independently verify the weather front, then it is not a hypothetical construct but is in a regular chain of correlated events. It is not dualistic.

A log burns. A sheet of metal rusts. These events occur because of phlogiston flowing from the hard substances into the atmosphere, leaving an ash or rust.

Comment: Burning and rusting are observable. However presence or change in phlogiston cannot be measured. Therefore, the example is dualistic.

A log burns. A sheet of metal rusts. A careful analysis of the anhydrous ash indicates that its weight has increased. The residue is bitter in taste.

Comment: The increase in weight with burning and rusting is reverse to the proposed loss of phlogiston. The burning and rusting are valid by observation. The change in phlogiston cannot be measured. Therefore he example is dualistic.

A log burns. A sheet of metal rusts. Careful measurement shows that anhydrous ash weighs more than the original products. The ash has a sharp (acid-like) taste (oxy-, sharp).

Comment: Some substance (oxy-) is generated (-gen) from the atmosphere to produce the breakdown of the hard substance (oxidation). Oxygen is a hypothetical construct until it becomes separately and individually measured. Then it becomes a regular scientific construct. In neither instance is it dualistic.

WILLIAM LOWE BRYAN

During my freshman year at Indiana University (IU) the silence was broken almost every day in the library reading room as an elderly deaf man brought in one stack of books to exchange for another. He could not detect his own loud voice. Later I learned that he was William Lowe Bryan, President Emeritus of the University. Born nearby he had entered IU as a youth to study classics. Then, with a cohort of other American students, he became interested in going to Europe for graduate study in psychology.

After a short study in Berlin he returned to Clark University to complete his Ph.D. with G. Stanley Hall in 1892. In that same year he helped Hall found the American Psychological Association (APA) with about 30 others. The following year he returned to IU to be a professor of psychology and vice president. He established the first psychological laboratory west of the Alleghanies. He published research on plateaus of the learning curves of local Western Union employees mastering telegraphy. In 1902 he began his 35-year tenure as President of IU. In 1903 he became President of the APA. Retired in 1937 he continued to live in the presidential mansion on campus and do scholarly work. It was during this period the decorum of the library was disturbed as he worked on his last book, *The Measured and the Yet-to-be Measured* (1947).

In my junior year (1948-1949), as President of Psi Chi, I had the privilege of inviting President Bryan to speak at one of the evening meet-

ings. It was there that I learned of his background and the striking story of reductionism.

Bryan had been fascinated with the work on learning and forgetting by Hermann Ebbinghaus at the University of Berlin. Like so many of his cohort, Bryan chose to study with him. Arriving in Berlin, however, Bryan and his colleagues found that Ebbinghaus could not take on doctoral students. The department chair, Hermann von Helmholtz, felt strongly that any doctoral dissertation in psychology should include study of its physiological underpinnings. Ebbinghaus had no interest in this. With regret he referred his many student candidates to Wilhelm Wundt in Leipzig. If not for this pipeline of students to Wundt, it has been argued that Ebbinghaus rather than Wundt would have been titled 'The father of modern psychology.'

Helmholtz was indeed a distinguished physiological psychologist. In 1860, the year of Bryan's birth, Helmholtz received the Nobel Prize for inventing the ophthalmoscope. He studied the spike and refractory phases of the single neuron. While still at the University of Heidelberg he had Wundt as his research assistant and doctoral advisee. Wundt's doctoral dissertation included the study of the urine of fellow medical students. Yet Helmholtz was victim to the logical error that ultimate understanding of psychology lay only in physiology and the more molecular constructs.

Other accounts of reductionistic bias were given by Bryan. One story concerned the negative view of social psychology in the United States. Although Wundt's theory applied broadly to social psychology, this view did not get taught in America. The Americans who flocked to Germany for study often lacked adequate German language skills.[9] They came back home without a proper mastery of either German language, Wundt's theory, or the role of molar constructs in psychology.[10] Moreover, Wundt's own prototypic introduction of Gestalt psychology was capturing more attention than the earlier work in social psychology. Finally, Freud's recent psychoanalysis (profoundly dualistic) was competing for attention. Much of Wundt's prolific writing in social psychology was yet to be translated into English. In sum, these forces served to strengthen the reductionistic biases away from Wundt's attention to molar constructs.

This American bias against molar constructs came to a climax when Harvard created a chair in memory of William James. In 1920 the first recipient of this chair was awarded to a British social psychologist James McDougall.

For the Harvard psychology faculty and for American psychologists elsewhere, to call this appointment a surprise would be an understatement. Early accusations that he was not following scientific method did not die away. The Harvard faculty – and, to an extent, all of American psychology – shunned and ostracized him. In fact, McDougall was a broad and creative thinker, but this fact rarely penetrated the biases against him.

One day in 1927 McDougall announced his resignation from the permanently endowed Harvard chair to accept the position as Chair of Psychology at the newly founded Duke University. On the morning following the announcement small clumps of faculty were gathered here and there in the Harvard yard to discuss the fact that the first person in the 231 years history of Harvard had resigned a tenured appointment. Until then, it was compared to a U. S. Supreme Court appointment. People were wondering what impact the resignation would have on the school's reputation. The news of these concerns spread quickly throughout academia.

Then Knight Dunlap, a psychologist at Johns Hopkins University, well known for personalized and vitriolic attacks made a public statement. According to Bryan's account of Dunlap, three parties were getting fooled. First, Harvard THINKS that it is losing a professor. Second, Duke THINKS it is getting a psychologist. Third, McDougall THINKS he is going to a university.

BACK TO THE PRESENT

Solutions to dualism and reductionism were not promised here. It is as if Moses was struggling in the wilderness without getting to the land of promise. Adequate exposure would be a signifi-

[9] Well documented elsewhere in texts of the history of psychology.

[10] One student, James McKeen Cattell, very poor in understanding Wundt's lectures „auf deutsch," redeemed himself in the lab by inventing the tachistoscope.

cant achievement. Some modest suggestions will be attempted.

An important advance was made, sort of, when psychology was defined in terms of a field of events within time and space. One can now determine whether mutual exclusion exists between two variables. Sometimes people may feel (erroneously) that freedom from logical errors constrains the range of events to be investigated.

If psychology is to be the study of behavior, it must also deal with that behavior where an observed creature is talking about what he sees, thinks about, fears, needs, likes, and loves. The 'hard' sciences do not have to cope with this. The task of being a behavioral scientist is not for sissies. Well, it might be called the 'harder' science.

ABOUT DUALISM

To judge progress toward eliminating logical errors it is helpful to look at where people commit them. People remain prone to ask a client or participant in interviews what their feelings or thoughts are. The form of query depends upon what the enquirer is looking for. The client or research participant will mold the response in terms of what impression is desired. Selective perception and dualistic inference will determine how the information is used. Then the inquirer may congratulate himself for the empathy he displayed toward events that were unavailable to him. Dualistic thinking may thus be capped with self-deception.

Over the years many methods have been used to gather introspective data. Of particular promise is the traditional version of the Kelly (1955) role construct repertory test (aka rep grid). This method will be described briefly, and then it will be compared with the interview in coverage and in prompting dualistic statements.

With the rep grid an examinee is presented a blank grid resembling a crossword puzzle (often these days decomposed with computer). The original published grid had 22 rows and 22 columns. Each column is designated with a living acquaintance or relative plus a column for the self. Each row has a set of three variably selected cells. From the three designated persons the examinee is asked to choose two that are most alike. After recording how they are alike, the third column figure description is recorded (or else the opposite of the first phrase given). Each of the cells in the row is then filled in with a binary or Likert metric to indicate how close the construct is from the contrast. Then this procedure is repeated on the succeeding rows. The final product is a numeric matrix with a construct and contrast (opposite) descriptor at the end of each row.

The examiner may then conduct a number of analyses based solely upon the examinee's own personal constructs. They include content and quality of chosen constructs; logical vs. illogical contrast/opposites; correlation or similarity among construct pairs; identification of self with mother vs. father, women vs. men in general, old vs. new acquaintances, people in general, negative vs. positive valence persons, congruent vs. mixed, vs. incongruent principal components (latent traits), and others.

A more recent advance in rep grid analysis has been the hierarchical cluster analysis, which models the examinee in terms of areas of hierarchical thinking. This multivariate procedure was advanced by deBoeck and Rosenberg (1988), and Sewell, Cromwell, et al. (1996) introduced the algorithm into the study of hierarchical breakdown in people with post-traumatic stress disorder.

If the rep grid introspective data set is compared with the traditional interview data set, the latter is more open-ended and therefore amenable to a wider range of hypotheses, both dualistic and monistic. A given rep grid protocol has a perimeter framed by the sampling of the column designates. The shortcoming of the interview requires trimming away dualistic statements of hypothesis. Shortcomings of the rep grid require broader sampling of column figures.

Although the examiner may choose either a subjective or objective language by which to connect the dots and report his interpretation, the rep grid is not prone to induce dualistic statements.

When a person is interviewed about their introspections, they give a snapshot view of what is within their field of awareness at that specific time. There is no way to ask what they cannot remember. When they take the rep grid and are presented with their results, they can identify what factors and construct pairings they are

aware of. Then there are other factors and pairings that come to mind only when they have been presented the rep grid results. There may be yet others that fail to be recognized even though they are valid on test-retest analysis. In this respect the rep grid is not only adequate but superior to the information obtained from the interview.

Almost all psychological tests can be manipulated by the examiner, especially if they have had a part in constructing the instrument. The examiner can usually create a desired impression. Lie scores and other techniques are used to detect and invalidate such malingering and falsification. The rep grid is highly resistant to these intrusions. Even those highly familiar with developing of the procedure can be highly surprised. Some who had helped develop the test completed it and were not prepared for the insights they expected. Then, when the intent was to falsify personal results, the test researchers had difficult modifying their own results.

A major shortcoming of the rep grid at this stage of development is that the input and output present a static picture. It is based solely on associative relationships, i.e., variations of the verb 'to be' (Cromwell, 2010, pp. 145-160). All human languages reveal in some way symmetric and asymmetric construct pairings. The rep grid at this time deals with only construct pairings. For example, if 'blond hair' is associated with 'blue eyes,' then 'blue eyes' are associated with 'blond hair.' In an asymmetric relationship, if A is associated with B, then B is not associated with A. [The employer (A) fired John (B). But B (John) did not fire the employer (A).] Work by Mechelan in developing a three-dimensional hierarchical cluster analysis algorithm would give promise that new knowledge could be advanced in this area.

In spite of the shortcomings and the lack of development, the rep grid would appear to be a useful instrument to advance knowledge without dualism.

It is therefore not surprising that personal construct theory provides an efficient and transparent way to do psychotherapy. Some studies, especially by the Winter and Viney groups (Metcalfe, C ., Winter, D. A., & Viney, L. L., 2007; Viney, L. L., Metcalfe, C., & Winter, D. A., 2005; Winter, D. A., 2003; Winter, D. A., 2016; Winter, D. A. & Procter, H. G., 2012; Winter, D. A., & Watson, S.,1999) have exceeded traditional and cognitive therapeutic outcomes.

ABOUT REDUCTIONISM

To illustrate the present status of reductionism issues two empirical studies are taken from our Vanderbilt University laboratory. The first one will concern responses from watching a stressful movie. The other concerns treatment and survival from acute myocardial infarction.

In the first example (Wehmer, 1966) research subjects were shown a movie[11] of Australian aboriginal pubescent boys participating in a subcision ceremony. In this ceremony a sharpened stone is used to cut into the ventral side of the penis so that urine comes out the ventral side. At designated times during the movie blood was drawn by cannula and ratings were made on anxiety and fatigue on a mood adjective check list. During stressful parts of the movie plasma 17-hydroxy-corticosteroids and mood ratings were elevated and during neutral periods they were not. Plasma levels[12] and mood ratings were highly correlated.

A reductionistic bias would hold that the plasma 17-OH-CS was responsible for the elevation in mood ratings. The opposite bias would maintain that the mood states were causing the plasma steroids to elevated. A symmetric correlation between the two would reflect no logical error or bias. Are you yet prone to a reductionistic bias in cross-disciplinary research?

In a different example (Cromwell, Butterfield, Brayfield, & Curry, 1977), 186 acute myocardial infarction patients (and 191 control patients elsewhere in the hospital) were studied with several research procedures. Upon admission the coronary patients were preassigned different nursing care protocols [information about the seriousness of their disorder (high, low); socially diversional activity (TV, visitors, etc. vs. restricted stimulation); and participation in self-treatment (operate cardiac monitor, take clinical

[11] Film by anthropological research group.

[12] Plasma steroids have a 70-minute half-life once released into the blood stream.

notes, isometric exercises vs. bed rest and restriction of activity)].

Length of stay in coronary unit, length of stay in hospital, re-admission with another acute MI within 90 days, and death within 90 days were recorded.

The group given extensive information about their condition had a striking result. When high information was linked with high participation in self-treatment, MI patients yielded the best outcome on all four dependent measures (shorter coronary unit stay, shorter hospital stay, fewer MI rehospitalizations within 90 days, no deaths within 90 days). In contrast, those MI patients with high information linked with low participation had the poorest outcome on all four dependent measures.[13]

Another finding illustrates the xHy in that the H, the inferred obsessive stress (from knowing what is wrong and then being told to lie back and do nothing about it) vs applying oneself usefully, i. e., 'getting on with it,') implies an intervening stress/nonstress variable that is not measured but nevertheless explains the finding.

This finding illustrates research across disciplinary languages but is not a candidate for dualistic or reductionistic flaw.

All variables in the project were examined to determine what predicted coronary outcome. Here came the unexpected result that the EKG and enzyme variables tended to be poorer predictors than the psychological ones. Those patients who had a lower mood adjective score for social affection when leaving the coronary unit had a higher rate for passing away in the next 12 weeks. Instead of happiness and 'chocolates for the nurses,' these patients had low mood level for social affection at the time of leaving the coronary unit. It became apparent that this finding restated the well-known observations from death marches and concentration encampments of World War II, during death marches and World War II concentration encampments, that prisoners prior to demise failed eye contact and disengaged socially from their peers. In the present study the strongest predictor of death was a low score on social affection at the time of discharge from the coronary unit.

FINAL THOUGHTS

In this final section a fable will be presented, and comments will be made on its relation to the theme of this paper.

What would Janet have done?

Once upon a time there was a planet with a species of creature not fully evolved in language and cognitive skills. Individuals respected rules of logic as the path to advance knowledge. They failed to see observation as necessary to ratify reality. In spite of their endorsement of logic no one was perfect. Each person seemed to violate logic in one or another way, yet adamantly adhere to guidelines of logic in other ways. One could become terribly distraught at the breakup of one's marriage, yet enter an illicit love affair with impunity. Another would have no remorse in making a large falsified deduction on their income tax, yet would never think of taking the same amount from the cash drawer in a bank. One would report having received sexual harassment but dress as sexually provocative as possible when being interviewed for a job in a closed setting.

Then one day a leader was elected who openly committed misdeeds and violations, openly denied them, and then switched positions on admitting or denying. In Machiavellian fashion he would often leave one of his staff to be punished for his crime.

People were left in a state of confusion. Scholars gathered in clumps around the college yard discussing what this could portend to the status of the nation. Some of the written laws that governed their society were getting violated but little was done without ambiguity and counterclaims. The base of voters took their respective sides for or against him. These extreme opposing sides came to be called 'base indeed.' Lawmakers abandoned their sworn allegiance to the nation's guiding laws in favor of these political affiliations. The news media, with no education in science, political science, or ethics, were of no help. They, and their consumers, acted

[13] No patients over 60 were admitted to the study. In addition, 23 were judged too severe to participate. Thus, the findings should not be generalized to the higher risk population. No patients had a recurrent MI or died while in the hospital, but some had recurrent MIs or died during the three months after discharge.

only with broad inadequate assumptions that people are either good or bad, that their job was to find the publically-held opinion, and to label the leader with one epitaph or the other. While reporters were committed to the 'truth,' they had failed to grasp the complexity of the word. Scholars and analysts came to the conclusion that this newly elected leader was mentally deranged, patently dishonest, or brilliantly carrying out a scheme of confusion in order then to sweep in an entirely new form of government. They debated endlessly, even voted after panel discussions.

Meanwhile, ages before on another planet, another society of creatures had become more advanced in language, logic, and science, but they expired from a contagious disease. They had a scholar in their midst called Janet[14] (1889), who was interested in these things. He came to recognize that a monolithic construct of character was not sound. For a single individual there was no good or bad. Instead each person through experience developed his/her own set of knowledge hierarchies. In a flash of insight he saw that they were logical, morally consistent, and self aware within each hierarchy but random or blind from hierarchy to hierarchy. This compartmentalization he called dissociation.

Dissociation occurred in different levels of intensity. At the mildest level almost all people could get carried away (lose themselves)) while reading a novel or watching a movie. When finished they could regain their identity. On a more intense level of dissociation they may think that they are someone else, in a different place, or just in a fog. It is here that the many contradictions in behavior could be observed. A partial awareness could arise where, while in one hierarchy, a loss of awareness of other personal hierarchies would occur. Besides the symmetric linking of construct pairs, A to B and B to A, or asymmetrically, with either A to B or B to A but not both, the degree of narrative explanation is reflected in the narrative that describes the relationship. For example, a person traumatized and affected with PTSD, will have trouble "telling the story," i.e., constructing the narrative of what happened.

At the most severe level of dissociation came psychogenic amnesia. Their separate hierarchies were so discrete that they could not remember their own identity or large gaps of time. Such individuals were easily sorted out and called disturbed. If traumatized with PTSD they will be completely unable to construct a narrative story of what happened. They have lost the ability to explain.

As Janet and his pupils would look across the bridge of time to this new undeveloped planet, it would be evident that the confusion and transgressions displayed in their new leader was not described with terms of mental illness, dishonesty, immorality, Machiavellian, traits, brilliantly scheming, or other. The most likely construction for his behavior was that he had moderate dissociation. He lived within a world of separated hierarchical clusters. Within one hierarchy he would make moments and carry out deeds logically consistent with the guidelines he had developed for that hierarchy but not for others. Then within the perimeter of another hierarchy he would do the same. However, from hierarchy to hierarchy he was correctly described as contradictory, false, or otherwise deceptive to the public.

What would Janet's solution have been for resolving the turmoil?

As we turn from this fable to dualism and reductionism, we find the same underlying principles, whether in science or civil affairs. Advancement depends upon the generation of propositions that are testable. Advancement will not occur when hypotheses are not amenable to testing. When a construct outside observability is linked to one observable, a *cul de sac* occurs. The cul de sac is problematic if not recognizable. If not recognizable the development of new hypotheses stops. Knowledge becomes static. Another hazardous construction comes when constructs are viewed as 'not observable or measurable but some day will be.' Such constructs may become

[14] *Pierre Marie Félix Janet* (1859 – 1947) was a pioneering French psychologist, philosopher and psychotherapist in the field of dissociation and traumatic memory. He is ranked alongside William James and Wilhelm Wundt as one of the founding fathers of psychology (*Wikipedia, Ed. note*)

embedded in the everyday language but may not be useful scientifically.

As for reductionism, any construct in a hypothesis or empirical statement may be sorted as to relative level of molecularity vs. molarity. This dimension refers to the time/space compass of the construct. Those constructs that have had a longer history of scientific study tend, correctly or incorrectly to be viewed as the more basic or causal. They tend to gain a mantle of truth. Actually, the more functional epitaph for a validated hypothesis (aka truth) is that it has been entered into competition with other validated hypotheses for having the greatest predictive utility or 'explainability.'

Truth is never a static picture; it is a dynamic picture of which testable proposition has the lead to predict more events at higher precision over a greater period of time.

Never then can we say that one level of construction causes another. To have one hypothesis be validated extensively on one level of molarity does not mean that it will be found to have greater level of predictive utility, whether on a more molecular, more molar, or the same level.

For one construct to be found valid (aka truthful, most predictive or explanatory power), does not mean that another construct might not be found also valid.

The common goal of mankind, whether in science or in civil affairs or in other areas, is greater prediction, control, and understanding. Good luck!

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ABOUT THE AUTHOR

Rue L. Cromwell began training in psychology at Indiana University. As assistant to *W. N. Kellogg* he aided in surgery or anesthesiology as classical conditioning was attempted on the surface of dogs' brains. The Korean War began as he graduated and entered the Air Force as a second lieutenant. A national crisis was announced when understaffed VA hospitals were overfilling with aging neuropsychiatric casualties of World War II.

Cromwell was called from the military into graduate training at The Ohio State University. Master's degree was completed with *George A. Kelly* and Ph.D. with *Julian B. Rotter*. Hospital internship was completed at Chillicothe VA Hospital, and psychotherapy internship was completed at Columbus (Ohio) VA Mental Health Clinic. He then worked as a child clinical psychologist at the Ohio Bureau of Juvenile Research, founded by Henry Goddard. Returning to graduate school he became Assistant Instructor and Clinic Coordinator of the Ohio Psychological Clinic. He administered the Clinic, did intake on all the admissions, and prepared the cases for Professor *Kelly's* rotation as practicum supervisor.

After PhD, Cromwell accepted an assistant professorship at Peabody College in a special NMH program to train psychologists with research skills in mental retardation. Eventually this position merged with becoming Professor and Director of Research in Psychiatry and the Vanderbilt University School of Medicine. He then left Nashville to become Chief, Division of Psychology, Lafayette Clinic, Detroit. Then he became Professor of Psychiatry, Pediatrics, and Psychology at the University of Rochester School of Medicine and Dentistry. In this position he was director of the longitudinal study of offspring of parents with schizophrenia. Finally, he became the M. Erik Wright Distinguished Professor of Clinical Psychology at the University of Kansas. Retirement came with the collapse of the World Trade Center in New York, and he found time to write.

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Received: 1 December 2017 – Accepted: 6 December 2017 – Published: 7 December