

Memory: A Logical Learning Theory Account

Joseph F. Rychlak

Loyola University of Chicago

An interpretation of memory from the perspective of logical learning theory (LLT) is presented. In contrast to traditional associationistic theories of learning and memory, which rest on mediation modeling, LLT rests on a predication model. Predication draws on formal and final causation whereas mediation is limited to material and efficient causation. It is held in LLT that memory begins in predicate organization, where framing meanings are logically extended to targets. Passage of time is irrelevant in this meaning extension. The effectiveness of memory depends on the cohesiveness or "tightness" of meaningful organization as framed by a relevant context. Well-organized contexts facilitate memory and poorly organized contexts are detrimental to memory. Possible reasons for good or poor organization in memory are discussed, and relevant research findings cited. The paper closes with a separate definition of memory as a content and as a process.

This paper analyzes the nature of memory from the viewpoint of logical learning theory (LLT) [Rychlak, 1994]. "Logos" devolves from both Greek and Latin roots meaning the *word* or, more precisely, the core *meaning* which the word expresses; it was also used to refer to a *rational order*, lending meaningful understanding to experience in spite of flux and change. Such patterned meaning is what is under study in LLT. It should not be thought that the aim here is to identify the correct or "logical" way in which to think and learn. The interest in LLT is as great for the eccentric and erroneous as for the established and accurate.

A major aim is to distance LLT from traditional learning theories that have relied on such associationistic principles as contiguity and frequency to account for memory retention at the expense of meaning. The quarrel here is

This paper is a revised version of an invited address, delivered on August 12, 1995, during the Science Weekend of the 103rd Annual Convention of the American Psychological Association, held in New York City. Requests for reprints should be sent to Joseph Rychlak, Ph.D., Department of Psychology, Loyola University of Chicago, 6525 N. Sheridan Road, Chicago, Illinois 60626.

not with the *methodological* findings on frequency and contiguity in learning and memory but with the *theoretical* explanations of such empirical results, which continually underestimate the role played by the participant's meaningful understanding in generating such measurable results (for an extensive analysis of current literature on learning and memory from the LLT perspective see Rychlak, 1994). Psychology is now secure enough as a science to permit alternative theoretical groundings to account for the *same* empirically observed data (Rychlak, 1993).

In her excellent survey of Western history, Carruthers (1990) found two metaphors being repeatedly used over the centuries to explain memory: as a wax imprint, and as a storehouse (p. 14). Note that the role of meaning *per se* is not primary here. First, memory has to do with the registering and retaining of "whatever" enters mind, and then second with any different meanings that happen to be so registered and retained. Today, we still speak of an *imprinting* in the sense of an "input" copy (representation) of something that is formed external to and therefore stands independent of the memory process. And, we are said to have memory stores — whether short- or long-term — from which such copies are subsequently retrieved. This kind of theorizing is third-person or *extraspective* (on the outside) in style. It is a quasi-engineering formulation of "that" or "it" observed taking place "over there." In human terms this comes down to an observation of "he, she, him, her, they, or them."

It is important to distinguish between a process and its content at this point. A *process* is a "discernible, repeatable course of action on the basis of which some item under description is believed to be sequentially patterned" (Rychlak, 1994, p. 319). A *content* is an "ingredient that is produced, conveyed, or otherwise employed by a process" (p. 311). In physical science, gravity is a process that directs the actions of various contents, from the planets in our heavens to steel balls rolling down inclined planes in the laboratory. Memory can be similarly divided and studied in terms of its process or its content. We remember a telephone number as a content in a memory process.

Logical learning theory eschews *extraspective* theorizing, which is to say that *all* of its conceptions are framed from a first-person or *introspective* (on the inside, looking outward) theoretical point of view. We might even say that LLT is a phenomenal theory, in which the "I, me, my, our" point of view is continually under study. Logical learning theory is an *objective idealism*, in contrast to the *objective realism* of traditional learning explanations. In idealistic theorizing, meaning becomes all-important. Indeed, meaning — that is, what a *symbol* (as word, image, etc.) points to, expresses, or frames — becomes intrinsic to the very process under consideration. To help clarify process differences between LLT and the received view of learning in psychology we have to take a brief look at causation.

Causation

Traditional explanations of learning have followed British philosophy in assuming that the ultimate or “real” cause of anything is the efficient cause, and also to some extent the material cause. These causal meanings devolve from Aristotle (his views, circa 350–322 BC, are cited from the *Great Books Collection*, 1952a, p. 271), who had pulled together the explanatory assumptions used by his predecessors and named four basic causes — material, efficient, formal, and final. The Greek word Aristotle used here was *aitiá*, which means “responsible for,” so that to speak of causes is to assign responsibility for the existence of some object or action.

Briefly stated, the *material cause* is the substance that constitutes things, as wood versus plastic; the *efficient cause* is the impetus or thrust involved in motion, as when one billiard ball strikes another; the *formal cause* is the patterning in events, as the funnel cloud in the sky warning of a tornado or the derivation of a mathematical proof; and the *final cause* is “that” reason, purpose, or end “for the sake of which” something exists or an act is being carried out. The Greek word for an “end” (target, wish, goal, purpose, reason, etc.) is *telos* and therefore a theory that employs the final cause is said to be a *teleology*. Logical learning theory is such an introspective teleological formulation — framed solely to explain human behavior, and *not* to be confused with deity or natural teleologies that are framed for other reasons (see Rychlak, 1994, p. 8).

From the time of Aristotle until the 17th century — roughly 2,000 years — *all four* causes were used to generate and explain knowledge, including scientific knowledge. Beginning in the 17th century problems arose over the use of final causation in science, as when Galileo was repressed by the Inquisition on the matter of whether our universe is geocentric or heliocentric. The clerics of the Inquisition, following final-cause assumptions drawn from Biblical teachings, considered Galileo’s heliocentric theory to be sacrilegious. Sir Francis Bacon carried on a diatribe against Aristotle, demanding that final-cause description be kept out of “natural” science, although he did accept it in the realms of metaphysics, aesthetics, and ethics (Rychlak, 1994, pp. 9–10). Newtonian science embraced the Baconian admonition, and psychology as a fledgling science in the closing decades of the 19th century *also* fell into line.

The upshot was to be the extraspective, quasi-engineering style of discourse that we have been considering, in which efficient causation was presumed to be the *only* suitable form of explanation in psychology. Material causation was also important, as in the concepts of a brain engram carried by nervous tissue, or the physical drives that were supposedly involved in classical conditioning. A formal-cause pattern was considered a secondary mani-

festation of underlying efficient causes, as when routinized habits were “shaped” into the organism’s behavior. But a final-cause explanation was *not* considered an acceptable scientific explanation. And so it is that traditional learning theories (as well as modern computer theories) have the person behaving mechanically, without *primary* reliance on meaningful intention or choice. According to LLT, predication modeling enables us to express the latter conceptions with rigor and clarity. We now turn to a consideration of predication versus mediation in explanations of behavior.

Predication

If we stand as observers and limit ourselves to an extraspective description of behavior “over there” in third-person fashion, relying on efficient-cause thrusts to move the behaving organism along in the manner of one billiard-ball bumping another, we necessarily arrive at an explanation in which only frequency and contiguity make things happen. The upshot is always mediation. A mediation process is one in which *a content that is patterned or shaped elsewhere and then input comes to play a role in the process that was not initially a part of it or produced by it.* Below is a characterization of the mediation model.

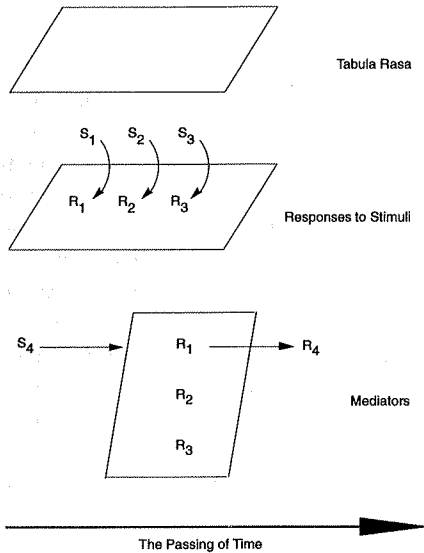


Figure 1: Mediation model. Figures are reprinted with permission from Joseph F. Rychlak, *Logical Learning Theory: A Human Teleology and its Empirical Support*, © 1994, University of Nebraska Press.

The passage of time is essential to mediation. Initially, the mediating process is as a tabula rasa, waiting for inputs to occur. Stimuli then etch responses onto the blank-sheet mind. Later, these etchings serve as mediators to facilitate ongoing processing. The process does not itself create (shape, organize) the mediators, but merely takes direction from them as received and retained in memory. When John Locke, an early framer of the mediation model, discussed the mental process he sometimes spoke of ideas as akin to teacups, being placed into a cabinet; this is a version of the storehouse metaphor (see Cranston, 1957, p. 266). The idea is shaped into existence elsewhere and then brought into the mental storehouse which is passively influenced to go “this way or that” as directed by the external influence. Frequency now assumes paramount importance in the explanation for, to use another of Locke’s metaphors, the mind is like a “smoothed path” (Locke, 1952, p. 249), rubbed into habitual patterns — after a tabularasa beginning — by repeated efficient causes taking place over time. As for memory, the *deeper* the habitually smoothed pathway, the better will it be. Figure 2 depicts various types of mediation models framed from an extraspective theoretical perspective.

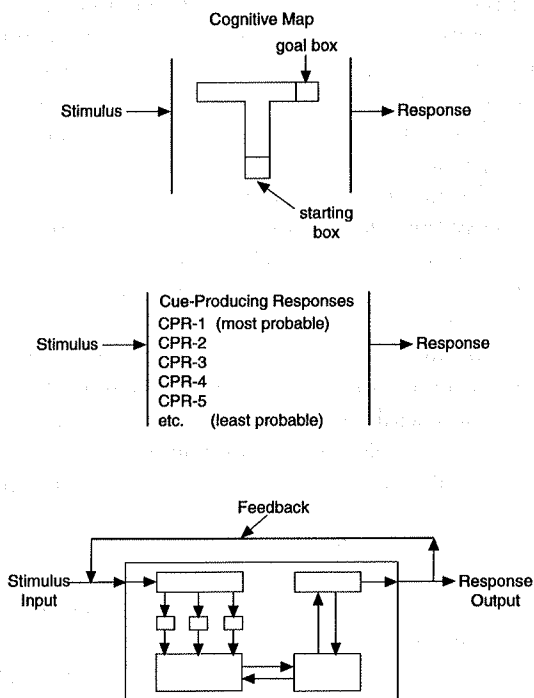


Figure 2: Examples of mediation models.

At the top of Figure 2 we have Tolman's (1932/1967) model, in which a rat has presumably input a *cognitive map* of a T-maze through frequent past experience exploring its layout. This pattern is input exactly as we see it; the mediation process has nothing to do with shaping it. The cognitive map can now be used as a mediator to facilitate further running from the starting to the goal box. In the middle of Figure 2 we have Dollard and Miller's (1950) adaptation of Hullian mediation, in which cue-producing responses (contents as language terms or images) that previously had been etched upon the tabula-rasa intellect now serve as mediating facilitators of ongoing behavior. Once again, the mediation process does not enter into the patterning of the cues per se, which are input like pre-shaped Lockean teacups.

At the bottom of Figure 2 we have a computer formulation of mediation in which input signals (contents) are guided by programmed instructions, storages, retrievals and the like, until such time as outputs are effected. The computer model has added feedback to the mediation process — which is a portion of the output returning as input. Although an important addition, feedback does not change the basic mechanism of mediational processing. Network models add to the complexity of mediation modeling but they retain the typical extraspective perspective, efficient causation, and reliance on frequency and contiguity to activate or trigger both cognition and behavior.

When we now turn to a predication model, the emphasis shifts from efficient causation to formal/final causation as the basis of mental functioning: *predication is the logical process of affirming, denying, or qualifying precedently broader patterns of meaning in sequacious extension to narrower or targeted patterns of meaning. The target is the telos (aim, end, "point") of the meaning extension.* The word *precedent* refers to a meaning occurring first in logical order, and the word *sequacious* refers to logical necessity, the fact that meanings extend so that we can reason in what is called an inductive or deductive fashion. We can think of this process in terms of Euler circles, as depicted in Figure 3. When we say "John is reliable" what meaning are we conveying? We are sequaciously extending the meaning of reliability "to" the meaning of John. The former necessarily predicates the latter. This necessity arises when we do, indeed, affirm the relationship of reliability and John's behavior. It is, of course, always possible to negate such an extension of meaning (see below, on the role of oppositionality in cognition).

We understand predication here *introspectively!* The larger circle symbolizing "reliable people" in Figure 3 must be thought of as a kind of template through which — or "for the sake of which" — a person (the predicator) would be conceptualizing (verbally or via imagery) in order to lend meaning to the targeted dark circle symbolizing "John." The meaning of "reliable" is a logical precedent — a contextual frame of reference — that *extends* its meaning to the target. The predicating context here is a word and we are using

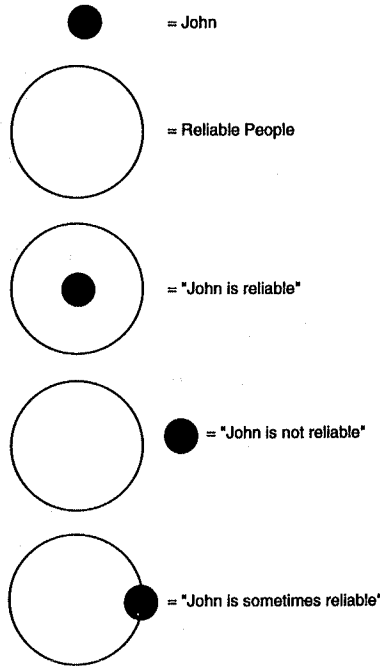


Figure 3: Euler circles as a model for predication

the example of a statement or sentence at this point. But predication can be purely visual and it does not have to take on sentence form (we might, for example, “see” in our mind’s eye John standing with a group of other “reliable” people whom we know; he is “one of these”). Predication as we are using the concept is *not* tied to syntax but solely to semantics. Holding a stereotype of some social minority (or majority!) is in effect predicating this group — or representatives from this group — with a prefigured meaning. We are replacing the efficient-cause emphasis of the mediation model with the formal/final-cause emphasis of the predication model. As broad realms of meaning, *predicates are always contexts or context-setting*. The issue is that of patterning, from broader to narrower ranges of meaning. We are dealing now with a teleological form of description, relying on meaning in a way that is impossible to accomplish using mediational explanation.

The meaning of “reliable” is broader in range than is the targeted meaning of John since people other than him are reliable and thus could be included in the broader Euler circle (as per our imagery example). But we now want to extend the meaning of reliability, a known concept, *specifically* to John. Time’s passage is not required in this model, because once the relevant meanings are aligned the broader meaning is literally a conceptual part of

the narrower meaning being targeted (i.e., the specific person named John). The determinism here is formally causal, arising from patterned organization rather than from the billiard-ball thrusting of an "earlier" cause impacting a "later" effect. The formal-cause patterning that LLT relies on here is an introspectively framed variation on the extraspectively framed, formal-cause patterning that Bohr (1934, pp. 5–8) relied on in his stationary-state theory of the atom. Bohr's stationary-state conception cannot be understood in efficient-cause terms (p. 4).

We must also appreciate that the process here is independent of the word contents being processed within it. We can say "A tree is like a person" or "A person is like a tree" and convey different meanings using the same word contents in a contrasting processing of meaning. In fact, if we considered John to be the very epitome of reliability we might well say "Reliability is John," using him now as a stereotype. Predication is not "in" the words signifying meanings but "in" the process which relates these meanings. Meaning is a relational conception, pointing to its referent (telos) symbolically. And LLT contends that the *basic* course of meaning extension in the process of predication is "from" the broader predicate content "to" the narrower target content. Contents change locations in the process, but the process remains constant. As already noted, predication is the context within which something is made known (or meaningful). We see predication in topic sentences, or in book titles, or in the scenery as a play opens on stage. We see it in people's body language, their expressions, and even in the sunshine or rain which sets a mood for our day.

We also frame contexts based on a predication involving *affection* or *affective assessment*. *Affective assessment is the rendering of a judgment or evaluation as to the likability (i.e., the preference, merit, interest, or fascination) of any meaningful item in experience.* Affection is easily confused with emotion, but LLT holds that an emotion is a pattern of physiological feelings sensed in a situation which is then contextualized by the individual's predications. Experiencing a certain emotion means that the person has framed and evaluated what this physiological reaction "is" based on the intellectual and affective context that the individual uniquely predicates as the emotion arises. Thus, in one context feeling a "righteous" anger is evaluated positively (liked) whereas in another a person could very well feel shame (dislike) for having what is now conceptualized as a temper tantrum.

Unlike the theories of Bower (1981) or Zajonc (1980), LLT does *not* consider emotion to be an independent factor, a separate process in cognition. As a complex of feeling-sensations, emotions must be predicated and thereby lent meaning. We do not deny the importance of the physical realm from which feelings take root. Rain falls from the skies to influence our behavior and emotional feelings fall upon us from yet another realm of the physical.

But a context is then established by the cognizing individual. Looked at introspectively, in first-person fashion, it is all the same process — that of predicating. Although we are now dealing exclusively with memory, it should be noted at this juncture that LLT distinguishes between understanding and action intentions (Rychlak, 1994, pp. 105–109). Predication is involved in both of these forms of intention, but only the action intention is manifested overtly as the individual carries out some purpose. Of course, a person can tell us about his or her understandings of things. But not all understanding intentions are carried over into overt behavior. Thus, a person may glance out the window, frame the understanding that it is raining, and yet show no overt signs that anything significant has occurred. If we knew more about the person's (introspective) hopes for the day we might discover that this unhappy knowledge just negated an earlier intention to call a friend and arrange a pleasant afternoon on the tennis court.

One last point on predication: LLT places great emphasis on *oppositonality* in human reasoning. If we think of the larger Euler circle in Figure 3 as sending a predicating meaning to its target, we must appreciate that there is a region outside of this circle which symbolizes what *it is not* — that is, all those meanings signifying a contrary, contradiction, contrast, or negation of the initial assertion. This broader expanse of oppositonality is relevant to — and hence extended to — the target under meaningful elaboration (the smaller, darkened circle of Figure 3). This is why it is possible for the person to either affirm or negate the meaning under elaboration — as, denying that John is reliable after all. In LLT the person qua predicator is viewed as always “taking a position” in ongoing life because she/he could be predicating otherwise via such oppositional possibilities. In the B.C. world, Heraclitus once said that we would never know justice if we did not confront injustice. In like fashion, we cannot know that John is reliable unless we can distinguish reliability from unreliability, and take a position regarding him accordingly. Oppositionality is fundamental to predication, including the predications of affection, where to like something is also to know what it would mean to dislike it.

Four Points on the Nature of Memory

We move now to four points that progressively develop the concept of memory that LLT embraces.

Memory begins in predicate organization. Memory is not something that occurs “after” predication has been accomplished. Memory begins with predication, and even in relevant background assumptions that are not stipulated in order for memory to take place. Since the extension of meaning is from a wider to a narrower range of meaning, we can begin analyzing the phe-

nomenon of memory from the outset of predication and the resultant meaning extension it instantaneously brings about.

Logical learning theory suggests that we must already know — have a frame of reference or context of meaning — in order to know further. We *tautologize* the meaningful patterns we presently use as predicating meanings “to” what can be known. We presume as children that school experiences will be identical to home experiences. In time, we learn that there is only a partial identity between these two realms of experience. We are then dealing in analogy. An *analogy* is a partial tautology between the predicating content and the targeted content — between home and school respectively, in this example. There is always an identical portion (the analogous) and a differential portion (the disanalogous) in such analogical meaning extensions. Metaphor is simply a further development of analogical meaning extension. Learning is always assumptive, using identities and differences in meanings like this.

Some psychologists would say that LLT is simply referring to what information-processing (mediational) models call *schema*, which supposedly actively organize cognitive structures exactly like predicates. How does LLT differ from such theories? The difference is that in LLT a predication is actually framed by the process, whereas in the mediational explanation the schema has been patterned externally — usually, through socio-cultural shaping — and then input. Anderson (1985, pp. 181–182) makes this clear in suggesting that Bartlett’s (1932) schema conception was a precursor of the program concept in computer theorizing. Executive programs are “entered” and not written by the machine process (including those executive programs that actually concoct programs.). Such contents are brought along exclusively via efficient causality. Also, as there is no oppositionality here there is no taking of a position in the information-processing “cognitive” process. In effect, such non-oppositional cognition is a *fait accompli*! In LLT, the predicational process is part and parcel of the framing of such schematic contents, so there is always the “taking of a position” going on. Such oppositionally-generated cognition is never a *fait accompli*, for it can always be redirected without additional external (shaping) inputs taking place.

When an initial target becomes sufficiently endowed with meaning (this can be sudden or arise over many extensions), so that the learner now comfortably understands it, this target can *itself* be used as a predicate. Learning has taken place. We draw on mother as a predicating meaning to target our preschool or kindergarten teacher — who is also female — and in time, after working out the similarities and differences, form an assumption of what “teacher” means, including analogical extensions to male teachers. We go forward to higher grades with this former target — now a predicate! — modifying it as called for based on subsequent experiences with teachers. But this

ongoing experience, which becomes a "past experience," is *always a predicated experience*. It is never simply a string of efficient causes. Psychologists speak of past experience "shaping" present behavior (see Hebb, 1974); but they usually omit the fact that this past experience is under predication even as it is taking place.

Learning is not only of such interpersonal relations (mother/child) or of the learning of words and concepts. It occurs in what may be termed "manual behavior" as well. For example, when first learning to drive an automobile we carefully target each aspect of the task — shifting, steering, carefully spacing our location relative to other autos and so forth. But at some point we can actually drive in this manner without thinking about the task per se. According to LLT, the entire panoply of "driving" becomes itself a predicating context that can then extend to other targets, such as "going to the store" or "getting to and from work." Another manual example is typing. Initially, the keys are our targets as we employ our knowledge (of the alphabet, the capacity to tap fingers, spelling of words, etc.) to gain further knowledge of the patterned keyboard. At some point we have tautologized (and analogized) this earlier knowledge sufficiently well so that we can actually employ the knowledge of typing as a predicating context within which we now "write a letter" or "record our thoughts." We no longer target typing, we target other ends in light of this predicating knowledge.

What has LLT to say about the very first predications occurring in life? It would take us too far afield to go into a complete discussion of this matter, but just to clarify one point: We do not have to postulate inherited ideas or inherited predicates in order to theorize in the way now being demonstrated. Logical learning theory holds that the predicational process begins at birth (or, whenever cognition may be said to begin). The first predications begin in the act of tautologizing an item with itself — as when the infant predicates "nipple is nipple" and then using the meaning of the nipple's identity moves on to "thumb is nipple," and so on. All such predications are carried on pre-linguistically, based on formal-cause patternings of sight, taste, touch, and so on (see Rychlak, 1994, p. 48).

Logical learning theory also employs a concept of *prememory*. Prememory is the assumptive framework that gradually forms in the course of learning and is therefore known, although it need not be remembered. Prememory encompasses what are sometimes called "universals" in thought, and these highly abstract predications need not be remembered in order for thought to rest on them. This holds true for less abstract predications, which doubtless become increasingly meaningful as life progresses. Evidence for LLT's claim that we can know without remembering can be seen in research on amnesiac patients (Warrington and Weiskrantz, 1970). Such patients recognize and recall words much more poorly than do normals. However, these patients per-

form as well as normals in completing fragments of words that have been presented before but are now introduced as a new task. For example, amnesiacs accurately complete the fragment *tab* more readily when they have seen (but cannot remember seeing) the word *table* previously in the experimental context than when they have not. This suggests that there must be some kind of implicit memory — in LLT terms, a prememory — functioning even when the patients cannot do well in recalling or recognizing the precise words (for many examples of this phenomenon, see Roediger, 1990).

Although understood entirely differently from LLT, Tulving and Thomson's (1973) encoding specificity theoretical explanation seems to take prememory into consideration. Research has shown that it is easier to recall something if the context circumstances at the time of recall are identical to the circumstances at the time of initial encoding (Smith, Glenberg, and Bjork, 1978; Tulving and Osler, 1968). This phenomenon may be seen at class reunions, where names long forgotten begin springing to mind as the old school context is revived by mixing among previously significant friends and associates. Tulving and Thomson (1973) interpret such findings according to the mediation model. They suggest that for good memory to result, correct retrieval cues must be coded at the time of and along with what is also being input and stored in memory (p. 369). On this view, both retrieval cues and information to be stored in memory are thought of as shaped by efficiently-caused influences external to the mediation process *per se*.

In contrast, the LLT interpretation holds that it is the logical suitability of predicational organization at initial contact with the target (the material to be remembered) that determines the efficiency of recall or recognition (see Lang, 1996, discussed below). Hence, it is logically "tight" (well-patterned) targets (e.g., names of certain former schoolmates) that are sequaciously revived when the proper precedent context (also a predication!) is revisited (the "old high school crowd").

Before moving to the next point, it should be emphasized that affective assessment is an extremely important factor in establishing a predicating context for memory. This assertion is backed up by about fifteen years of memory research using words, quasi-words, CVC trigrams, designs, pictures of faces, abstract paintings, and so forth (see Rychlak, 1994). When these items are idiographically rated for likability by "normal" participants (i.e., reasonably positive self-evaluators) who are then administered a memory task — to recall or recognize items from first to second exposure — a "positive affective assessment effect" is seen taking place. Liked items are recalled or recognized more readily than disliked, and this is independent of factors influencing the material being put to memory like familiarity, pronounceability, personal estimates of what is easy or hard to learn, frequency of occurrence in the standing language structure, and so on.

But if we study less well-adjusted participants, things go quite to the contrary. These samplings included hospitalized mental patients, depressed individuals, alcoholics, and individuals with weak self-images. In the learning and memory patterns of such individuals we find a collapse or outright reversal of the positive affective-assessment effect. In line with the predictions of LLT, these individuals who can be shown to predicate themselves and their life circumstances negatively, and therefore extend meanings more readily along a negative than a positive line of meaningfulness, actually remember their disliked items more readily than their liked items (for many such studies, see Rychlak, 1994, Chapter 7). Such positive or negative memory effects of affective assessment nicely demonstrate what LLT means by "precedent-sequacious meaning extension." There is a logical necessity which extends the meaning of a predicate to its target, once this patterned alignment is drawn (or "affirmed"). Such meaning extension also occurs analogically or partially, so it need not always be a literal matching of precedent "to" sequacious meaning. Predication is not matching; it is a process of encompassing, subsuming, or enriching.

We demonstrated that the *same* person can recall positively in a liked realm of experience, and negatively in a disliked realm of experience (Rychlak, Carlsen, and Dunning, 1974). College participants first identified a positive and a negative realm of life activity. Some participants rated "aggressively competing with others" as an agreeable (liked) challenge, but found "becoming passively intimate with others" a stressful (disliked) activity. Other participants were found with the reverse predilection. Words were then identified which were consistent with the meaning of aggressive competitiveness (e.g., incentive, decisive, demanding, excelling) or passive intimacy (e.g., sympathy, pamper, reverence, accepting). Participants rated all words for affective preference (likability). It was found that participants learned according to a positive affective-assessment effect while memorizing words in their agreeable realms, but reflected a negative affective-assessment effect while memorizing words in their disagreeable realms.

A similar affective contrast within the same individual's cognitive functioning was demonstrated in another study, where participants had to identify tachistoscopically presented quasi words (i.e., CVC trigrams) and abstract paintings, presented to either their right or left hemisphere "first" (which, according to LLT, is the point of precedent affirmation — termed a *protopoint*). College students served as participants (Rychlak and Slife, 1984). Slides of abstract paintings and CVC trigrams were flashed for one fifth of a second into either the left (predominantly verbal) or the right (predominantly pictorial) hemisphere. Participants had rated all of the slides for affective preference initially; lists of liked versus disliked trigrams and paintings were then assembled for all participants. The positive affective-assessment effect proved larger for

pictures than for trigrams when the slides were flashed to the left hemisphere. And, vice versa, the affectively-positive effect was larger for trigrams than for pictures when slides were flashed to the right hemisphere.

These findings were predicted by LLT, which holds that affective assessment serves as the very first discriminating capacity for the individual, a kind of prememory organization that infants use in their initial preverbal learning. Hence, we expect to find large differences between liked-disliked (in either direction!) whenever the meaningful material confronting the individual learner is difficult to predicate verbally. In line with this expectation, it was found that abstract words reflected a significantly larger affective-assessment effect than concrete words (August and Rychlak, 1978). Also, ethnic/racial minority participants rely more on the affective quality of verbal items than do participants drawn from the cultural majority (Garza, 1975; Rychlak, 1975; Rychlak, Hewitt, and Hewitt, 1973). The latter finding was predicted on the assumption that minorities in the US culture are less identified with linguistic, school-like memory tasks than are majorities. Foregoing emphasis on the linguistic aspect, the minorities apparently then fall back on the affective realm in their learning styles.

Memory is influenced by the fact that meaning is predominantly extended from the predicate to the target. One of the first problems facing LLT was to break free of the efficient causation underwriting stimulus-response or input-output theorizing. Fortunately, a lead was provided here by Aristotle (1952b), who once asked why one meaning attaches to another in mind, and then answered that this has to do with "the predication of one thing of another" (p. 565). And this is how LLT came to view association — not as an efficiently-caused connection, bond, or hook-up, but as a formal-cause meaning extending from a predicating context to its target. Adding phenomenal terminology to this line of theorizing it was then essentially held that the old stimulus-response formulation was itself a predication of the observed pattern of events. The formal cause is extremely important in this conception, where the very meaning of stimulus is delimited by the opposite meaning of response, and vice versa. A stimulus only "triggers" a response when the predicating circumstances make it possible. Not that we are unresponsive to stimuli at a bio-physical level, of course. A viral infection is a reality no matter what one's phenomenal realm may suggest. But insofar as we are dealing in memory and learning LLT maintains that predication is what takes precedence over a presumed free-standing reality in which stimulations trigger responses without such framing (contextual) patterns of meaning. This matter inevitably leads to the question of psychic consciousness and really cannot be dealt with satisfactorily in the present paper (see Rychlak, in preparation).

As a first step in shifting away from traditional S-R terminology, LLT began referring to behavior as telosponsive rather than as responsive. A *telosponse* is

a final-cause conception. It draws on the assumption that people behave “for the sake of” predicating meanings, which extend into ongoing behavior through both understanding and action intentions (Rychlak, 1994, Chapter 2). The meaning plays a central role in directing overt behavior at this point. Upon leaving a room, the person does not “respond” to a triggering door stimulus, but rather “telosponds” by affirming the passageway as the “that” for the sake of which he or she intends to exit for some reason (purpose, intention). Physical walking out of the room (legs moving, etc.) takes places as an instrumentality based on the precedent action intention being sequaciously enacted. Telosponsivity is always understood from an introspective perspective — looking though predicated meanings from the first-person point of view. Logical learning theorists always walk in the other person’s shoes.

If behavior is telosponsive in nature, what has this to suggest about memory? Well, since meaning is extended from a predicating context to a target, it follows that if someone has a poor memory for an item, cueing the former would be more important to recall or recognition than cueing the latter. The sentence “A blanket can be used as a tablecloth” may serve as an example. Assume that a person has read 24 sentences of this general variety and is now asked to recall as many as possible. The person recalls eight or 10 sentences but does *not* recall (among others) “A blanket can be used as a tablecloth.” To an associationistic theory there is no basis on which to say that cueing this sentence for recall with “tablecloth” (the original predicating meaning) is any better than cueing it with “blanket” (the original targeted meaning). Actually, cueing either word *will* facilitate recall. There is no argument here. But LLT predicts that, all things held constant, predicate cues should facilitate recall more readily than subject cues. This prediction was validated in a succession of four studies by Rychlak, Stilson, and Rychlak (1993). When we used longer, increasingly complex sentences it became difficult and then impossible to show this predication effect because people can convolute their predicated meanings so that we lose control of “what’s what” in the sentence structure.

However, we *have* shown the predication effect in other formats, including affective assessments. In one study we had our participants use either a liked or a disliked acquaintance as a predicating context in trying to recall adjectives from a list of 60 such descriptors that had been presented earlier (Hughes, 1993). These adjectives had both a liked and a disliked meaningfulness for the participants. We used words like *dominant*, *helpful*, *critical*, *sensitive*, and so on. After recalling all of the adjectives that they could which described a person of their acquaintance — say, a *liked* person — participants were then asked to recall as many of the remaining (unused) adjectives as they could, even though these words did not describe the liked person. At this point participants had exhausted their memory for the targeted words on

the list (i.e., those describing the liked person and any others that they could recall). We then asked them to think of a *disliked* person of their acquaintance, and, using this person's behavioral pattern as a predicating context, to target the list of adjectives once again. In other words, they were asked to try to recall words on this list describing this second person. We found that our participants could now recall between one and six additional adjectives that they had not used or recalled previously. The predicating context of the second person had generated and extended its meaningfulness to the "retrieval" of words in the list.

Forgetting has many varieties, all of which relate to the relevance, clarity, and tightness of predicate meaning organization at the point of recall. It would be foolish to claim that the kind of memory under consideration covers every aspect of this remarkable phenomenon. The present description draws on a *Logos* grounding, as opposed to the *Physikos*, *Bios*, or *Socius* groundings that can also be used to explain cognition and memory (Rychlak, 1993). It is therefore appropriate to question LLT concerning the role of brain functioning in memory — a form of explanation relying on *Bios* grounding. Surely psychologists can work in complementary fashion, studying a complex phenomenon from different perspectives at the same time. And these perspectives *need not* interact with or reduce to one another (although any one theorist might wish to formulate explanations in this overlapping fashion). There is no necessity to have one perspective "emerging" from another, thereby placing the groundings in some kind of hierarchy. Simply being clear about one's basic assumptions is all that complementarity calls for. As LLT contends, reality is always predicated (construed, contextualized, categorized, framed, etc.), and when the precedent predication shifts, the meanings being extended into any account necessarily (sequaciously) shift as well. Different grounds mean different accounts, and we do not have to apologize because one account fails to include, reduce, or emerge from the other. Physicists do not apologize for the fact that the wave theory of light fails to interact with, emerge from, or otherwise explain the particulate theory of light (or vice versa).

Consider the case of a person who has a brain injury or disease of some sort, and is losing memory. Does this not prove that memory is due to material and efficient causation after all, no matter how much the LLT enthusiast wishes to wax eloquent about formal and final causation? The answer here is "no, physical deficits do not necessarily capture the actual cause involved in memory deficit." If memory is, above all, dependent on the (formal-cause) patterning of meaning, its relevant internal consistency or "tightness," as well as its affective significance to the person involved in this cognitive organization, then obviously anything which served to weaken such an organization will promote forgetting. It does not matter whether the organization at

original learning is weak and sketchy due to the person's distraction on that occasion, confusion over factual considerations, negative affective assessments, ingested drugs, a brain tumor, illness, or senility. No matter which of these factors can be traced as the source of poor mental organization, the *fact of psychological importance* is that the framing context was just not adequately patterned for a lasting memory to take place. And to theorize about weak or sketchy organizing contexts is no more "mysterious" than the associationist's talk of stored and retrieved cognitive representations.

Cramming for exams may get one through on the short term, but on the longer term about all that is remembered is where to once again get the information when needed — an aspect of which is prememory. Or, the memory heuristics used to parrot material may also be recalled. Sometimes this "memory scheme" (such as the *method of loci*) is the only well-organized formulation that the person has available, particularly if the classroom instruction has been confusing or lifeless. I think that in such cases rote learning is a teacher's face-saving necessity, for at least then the student is provided with an organization pulling the essentially meaningless course material together for examinations or reports — "memorize these six points" or "write on those four principles." The ineffective teacher renders such demands and can then count on the students at least having something to remember for an examination or written report. Although it is possible for learning to take place with such rote formulae, it is also true that many if not most students never organize the material meaningfully under such directions. As a result, there is little memory retention of the course material, or what is worse, for its relevance to the ongoing educational process when "exam time" or "reports-due time" has passed.

We lack a suitable term to describe such well-organized, "tight" patterns of meaning in the predicational context. The gestaltists were actually getting at something of the sort in their reference to a "good gestalt" or *Prägnanz* (Koffka, 1935, p. 110), except that this concept is framed extraspectively and therefore really does not allow us to capture meaning in the way that LLT is trying to do. A tightly patterned, well-organized predication might also be made possible by the highly personal nature of the meanings being processed. Sometimes the patterning is due to the affective qualities, so that a negatively framed realm of meaning for a generally well-adjusted person may be disregarded even though it is fairly well-patterned. I don't think this is the same thing as forgetting. This is more like the Freudian notion of a repression (Rychlak, 1995).

The fact that elderly people tend to forget recent events more readily but retain their early life events is consistent with our analysis. That is, we might hypothesize that the elderly are losing a certain physical capacity enabling them to frame well-integrated meaning organizations in their more recent

predicational efforts. Their earlier (i.e., pre-physical decline) patternings of meaning are much tighter hence more effective by comparison. Once again, this is not a biological explanation of ineffectual memory.

An interesting question is: Are there differences in memory loss for differing brain disorders? It would follow from our analysis thus far that serious loss in brain function would surely affect the predicated meaning contents which establish the context. I have had only slight experience observing patients with Alzheimer's disease, but it strikes me that this is what is taking place in such an illness. If we could devise a method of assessing the relative extent of loss attributed to the *predicates* employed in memory as compared to *targets*, we might then have a new way of looking at memory loss in brain injury.

To elaborate on this point in a personal vein, I have always had difficulty in remembering names. I can, for example, sometimes recall a movie actor's image in my mind's eye, his or her major motion pictures, sometimes even the names of the parts he or she has played in these movies, and yet be unable to come up with this actor's name. Am I unable to conceptualize the proper context here, or is it that I have a good context but am unable to come up with the targeted name because of a competing context, possibly an affectively negative one? The same thing happens with certain words, where I know what I want to say but cannot recall the precise word I want to use — so, I settle for an alternative target. It strikes me that much of what we consider everyday "memory lapses" are of this type — more of a target than a predicating context problem. I suspect that were my predicating-context meanings "slipping" I would be involved in something a lot more serious.

A first step has recently been taken to prove that people do tend to pattern their understanding from predicate to subject/target of a statement, and that subsequent predicate cueing will combine with this preferred organization to facilitate memory (Lang, 1996). In this research, participants were given a series of 24 triplets consisting of three statements like the following:

A brain is a sponge.
Sponges can absorb.
Brains can take in.

Note that one of these statements is a metaphor (A brain is a sponge), and the other statements elaborate on the meaning of either the predicate (sponge) or subject/target (brain) of the metaphor. The order of the three statements was randomized across triplets. Participants (college students) were asked to rearrange and record the triplets in the written order that made greatest sense to them. The experimental hypothesis held that participants would elaborate on the predicate of the metaphor (sponge) first, followed by an elaboration of the subject/target (brain). This prediction follows

the precedent-sequacious nature of meaning extension postulated by LLT. In other words, regardless of where they would place the metaphor (A brain is a sponge) — first, second, or third place — it was predicted that participants would be more likely to list the predicate elaboration (Sponges can absorb) *before* they would list the subject/target elaboration (Brains can take in). This prediction was supported by the statistical analysis.

When later cued for metaphors, participants who were cued with the predicate of the metaphor (sponge) and who had initially organized memory with the predicate elaboration listed first (Sponges can absorb), reflected the best recall over all possible combinations of organization and cueing. That this superiority is not simply due to a matching of elaboration with cueing can be gleaned from the fact that the poorest memory of all occurred when subjects elaborated the subject first (Brains can take in) during initial organization and then were cued with the subject/target (brain) at recall. The findings are therefore totally in support of the cognitive (predicational) process postulated by LLT.

To pull this all together, we come to the fourth and last point: *memory involves both process and content, and can be summarized in three steps.*

A. A relevant assumptive meaning (i.e., a predicate) must extend to a target (this is, in effect, a telosponse).

B. A logical sequence or period of (what is known as) "time" occurs.

C. A recurrence of the initial meaningful organization is effected or approximated (this is also a telosponse).

Step A addresses learning — that is, extending a known meaning to a target. As life progresses, the meanings framed initially at A take on highly abstract, assumptive roles encompassing what we termed above the prememory. As noted there, meanings at A no longer have to "be" remembered for they literally frame predicationally the meanings that constitute memory. We do not remember how or when we learned what *bird* means, but we do know what a bird is — albeit in a global sense. Wittgenstein's (1968) concept of *family resemblance* touches on this matter of a predicating meaning being more encompassing than any one example of the meaning in question. Even so, we have a sense that certain birds (e.g., robin, sparrow) are more "bird-like" than others (e.g., ostrich, penguin) [Rosch, 1973].

Step B addresses "time," which is irrelevant to the predicational process, but it is also true that life has a logical sequence. There is an order of from what we name "earlier" to "later" in reasoning that must be considered. Here is where frequency plays such an important role in traditional theories of memory. Obviously, we repeat many things in life, and with repetition greater memory is likely to occur. But the point LLT makes is that this repetition is *predicated* repetition. It is the pattern of an increasingly enriched, stable organization that enhances memory and not some deeper cut of an

engram or the thicker diameter of a pathway between information nodes in the meat of the brain. These latter formulations are better understood as predicating meanings drawn from the *Physikos* or *Bios* and used in the *Logos* realm as metaphors or similes. The search for memory engrams has long since exhausted itself and the nodal network model is not faring too well in brain research these days (see Rychlak, 1991, pp. 144–150).

At Step C we have described what is generally called *memory*, as an effort is made to reconceptualize the framing pattern of what had taken place at A. Reconceptualization is not retrieval. Conceptualization does not consist merely of sensory input as if a tracing of the encountered reality had been effected and then reactivated at the point of remembering. This is not to deny that such copying aspects as sensory recognition are sometimes involved in memory. To give a mundane example of such purely sensory retention, we do not ordinarily think of our memory as taking place across eyeblinks — but we *could* do so, and if we did we would have to admit there is excellent memory taking place because we remember what we see “now” as identical to what we saw before the last blink! In more customary memory examples, there is a longer lapse involved — with other predicated meanings sliding in between “then” and “now” to confound memory thanks to their unrelated hence disorganizing meaning extensions. There is some evidence that through techniques like hypnosis or certain forms of focusing the person can recapture the original (predicating) context by dismissing the irrelevant intervening predications, and thereby remember the original target quite well (Dixon and Laurence, 1992). There is also evidence that reconceptualization can generate false memories.

In closing, here are alternative definitions of memory as either a content or a process: if we focus on the *content*, on the specific item to be remembered, we can define “a” memory as a target that has been extended meaning previously and is now being reconceptualized. Alternatively, memory as a *process* may be defined as the relative cohesiveness and clarity of a tightly organized, relevant precedent meaning that is being extended sequaciously to a previously predicated target.

References

- Anderson, J.R. (1985). *Cognitive psychology and its implications* (second edition). New York: Freeman.
- Aristotle. (1952a). *Physics*. In R.M. Hutchins (Ed.) *Great books of the western world* (Volume 8, pp. 257–355). Chicago: Encyclopedia Britannica.
- Aristotle (1952b). *Metaphysics*. In R.M. Hutchins (Ed.), *Great books of the western world* (Volume 8, pp. 495–626). Chicago: Encyclopedia Britannica.
- August, G.J., and Rychlak, J.F. (1978). Role of intelligence and task difficulty in the affective learning styles of children. *Journal of Educational Psychology*, 70, 406–413.
- Bartlett, F.C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge: Cambridge University Press.

- Bohr, N. (1934). *Atomic theory and the description of nature*. Cambridge: Cambridge University Press.
- Bower, G.H. (1981). Mood and memory. *American Psychologist*, 36, 129–148.
- Caruthers, M. (1990). *The book of memory: A study in medieval culture*. Cambridge: Cambridge University Press.
- Cranston, M.W. (1957). *John Locke: A biography*. New York: Macmillan Co.
- Dollard, J., and Miller, N.E. (1950). *Personality and psychotherapy: An analysis in terms of learning, thinking, and culture*. New York: McGraw–Hill.
- Dixon, M., and Laurence, J.-R. (1992). Two hundred years of hypnosis research: Questions resolved? Questions unanswered? In E. Fromm and M.R. Nash (Eds.), *Contemporary hypnosis research* (pp. 23–41). New York: The Guilford Press.
- Garza, R.T. (1975). *Affective and associative meaningfulness in the learning styles of Chicano and Anglo college students*. Unpublished doctoral dissertation, Purdue University, West Lafayette, Indiana.
- Hebb, D.O. (1974). What psychology is about. *American Psychologist*, 29, 71–79.
- Hughes, D.G. (1993). *Affective predication and the retrieval of personality-trait words*. Unpublished master's thesis, Loyola University of Chicago.
- Koffka, K. (1935). *Principles of gestalt psychology*. New York: Harcourt, Brace.
- Lang, K.M.S. (1996). *Predicational organization and its enhancement of memory*. Unpublished master's thesis, Loyola University of Chicago.
- Locke, J. (1952). An essay concerning human understanding. In R.M. Hutchins (Ed.), *Great books of the western world* (Volume 35, pp. 85–195). Chicago: Encyclopedia Britannica.
- Roediger, H.L. III. (1990). Implicit memory: Retention without remembering. *American Psychologist*, 45, 1043–1056.
- Rosch, F.H. (1973). Natural categories. *Cognitive Psychology*, 4, 328–350.
- Rychlak, J.F. (1975). Affective assessment, intelligence, social class, and racial learning style. *Journal of Personality and Social Psychology*, 32, 989–995.
- Rychlak, J.F. (1991). *Artificial intelligence and human reason: A teleological critique*. New York: Columbia University Press.
- Rychlak, J.F. (1993). A suggested principle of complementarity for psychology: In theory, not method. *American Psychologist*, 48, 933–942.
- Rychlak, J.F. (1994). *Logical learning theory: A human teleology and its empirical support*. Lincoln: University of Nebraska Press.
- Rychlak, J.F. (1995). The necessity and desirability of being repressed: Freudianism, behaviourism, and the denial of human agency. In D. Anderson (Ed.), *This will hurt: The restoration of virtue and civic order* (pp. 103–113). London: The Social Affairs Unit. [A National Review Book]
- Rychlak, J. (in preparation). *Psychic consciousness: A logical learning theory analysis*. Washington, DC: APA Books.
- Rychlak, J.F., Carlsen, N.L., and Dunning, L.P. (1974). Personal adjustment and the free recall of material with affectively positive or negative meaningfulness. *Journal of Abnormal Psychology*, 83, 480–487.
- Rychlak, J.F., Hewitt, C.W., and Hewitt, J. (1973). Affective evaluation, word quality, and the verbal learning styles of black versus white junior college females. *Journal of Personality and Social Psychology*, 27, 248–255.
- Rychlak, J.F., and Slife, B.D. (1984). Affection as a cognitive judgment process: A theoretical assumption put to test through brain-lateralization methodology. *The Journal of Mind and Behavior*, 5, 131–150.
- Rychlak, J.F., Stilson, S.R., and Rychlak, L.S. (1993). Testing a predicational model of cognition: Cueing predicate meanings in sentences and word triplets. *Journal of Psycholinguistic Research*, 22, 479–503.
- Smith, S.M., Glenberg, A., and Bjork, R.A. (1978). Environmental context and human memory. *Memory & Cognition*, 6, 342–353.
- Tolman, E.C. (1967). *Purposive behavior in animals and men*. New York: Appleton–Century–Crofts. (Originally published 1932)

- Tulving, E., and Osler, S. (1968). Effectiveness of retrieval cues in memory for words. *Journal of Experimental Psychology*, 77, 593-601.
- Tulving, E., and Thomson, D.M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 80, 352-373.
- Warrington, E.K., and Weiskrantz, L. (1970). Amnesic syndrome: Consolidation or retrieval? *Nature*, 228, 628-630.
- Wittgenstein, L. (1968). *Philosophical investigations* [third edition, G.E.M. Anscomb Trans.]. New York: Macmillan.
- Zajonc, R.B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, 35, 151-175.