What Would Licklider Think of Engineering Psychology Today?

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J.C. R. Licklider was the fifth president of Division 21 (1961-1962). An argument can be made that he has been our most influential member. I would love to be able to ask him this question personally as I think his answer would help us get our bearings and set our course for the future. Unfortunately, he passed away in 1990. So I am going to be presumptuous enough to try to guess what his answer might have been. Please permit me this indulgence as I think it provides the basis for fruitful reflection and discussion. At the very least it allows us to review his contributions and ideas, which are certainly worthy of periodic review. Licklider preferred to be called Lick, and I shall honor that preference for the remainder of this paper.

Let us begin by providing a brief chronology. Lick was born March 11, 1915 in St. Louis, MO. He studied math, physics, and psychology at Washington University in St. Louis earning a Bachelor of Arts degree in 1937. He continued at Washington University earning his M.A. in 1938. Lick did his doctoral work at the University of Rochester earning his Ph.D. in 1942 with a dissertation entitled, "An Electrical Investigation of Frequency-Localization in the Cat." He then went to Swarthmore where he was a research associate and studied Gestalt psychology with Wolfgang Koeller. From 1943 to 1946 he worked as a Research Fellow in the Psycho-Acoustics Laboratory at Harvard. He was interested in high-altitude communication, particularly in ways of compressing speech to increase the carrying power of radio. He invented clipped speech and it worked very well. From 1946 to 1949 he was officially a Lecturer at Harvard, but he mainly did research. He also was a regular participant in the circle Norbert Wiener ran on Tuesday nights. From 1950 to 1957 he went as an Associate Professor to MIT to start up a psychology section which he hoped would eventually become a Psychology Department. In the summer of 1951 he participated in Project Hartwell, which was Navy supported research concerning underseas warfare and overseas transport. From 1952 to 1953 he was a participant in Project Charles, which was an air force study of air defense.

He said that a third of his time was at the acoustics lab, a third trying to build a psychology section, and a third at Lincoln Laboratory where he had to learn digital computing because analog computers could not do the job. From 1957 to 1962 he was Vice President for psycho-acoustics, engineering psychology and information systems at Bolt Beranek and Newman. He and his family moved to the D.C. area in 1962 when he became the Director of the Information Processing Techniques Office (IPTO) of the Pentagon's Advanced Research Programs Agency (ARPA). It was at ARPA where he put in place the programs that led to interactive computing and the internet. It was noted that he was different from most heads of branches in the government. He did not sit in his office waiting for proposals to arrive after sending out a brochure. Rather, he was proactive running around the country trying to generate enthusiasm. In 1964 he left ARPA to become Manger of Information Sciences, Systems, and Applications at the Thomas J. Watson Center of International Business Systems. From 1968 to 1970 he was the Director of MIT Project MAC where he concurrently served as Professor of Electrical Engineering. He continued at MIT until 1974 when he returned to ARPA to again serve as Director of IPTO. In 1975 he returned to MIT where he finished his career as a Professor at the MIT Laboratory for Computer Science. He became a Professor Emeritus in 1986. He died in 1990 from complications after an asthma attack. He was survived by his wife, Louise, a son, Tracy, and a daughter Linda Smith.

Lick won the Franklin V. Taylor award for outstanding contributions to the field of applied experimental and engineering psychology in 1966. In 1958, he served as the President of the Acoustic Society of America. He also belonged to the Academy of Arts and Sciences and the Association for Computing Machinery. And he was elected to the National Academy of Sciences. But, of course, the most significant fact is that he belonged to Division 21.

Lick is regarded as one of the most influential people in computer science. When he was at ARPA from 1963-1964 he set the funding priorities that would lead to the internet, the invention of the mouse, windows, and hypertext. At this time, no U.S. university granted a Ph.D. in computer science. Lick's ARPA program provided the research base at four of the first universities to establish graduate degrees in computer science: UC Berkeley, CMU, MIT, and Stanford. For a splendid review of Lick, his achievements, and “The Revolution That Made Computing Personal,” *The Dream Machine* by M. Mitchell Waldrop (2001) is highly recommended.

I shall consider two of his papers, as they are relevant to the question being addressed. They are also regarded as his most seminal papers. They are *Man Computer Symbiosis* (1960), and a paper co-authored with Robert Taylor, *The Computer as a Communication Device* (1968). Let us consider *The Computer as a Communication Device* (1968) first. This paper begins with the bold assertion that “In a few years, men will be able to communicate more effectively through a machine than face to face.” OLIVER was a key component of this effective communication. OLIVER is an acronym that through fortunate happenstance corresponded to the first name of its originator, Oliver Selfridge. OLIVER stands for on-line interactive vicarious expediter and responder. OLIVER would take notes when so directed, would know what you do, what you read, what you buy and where to buy it. It would know your friends and acquaintances and would know who and what is important to you. This paper made heavy use of the concept of “mental models”, which was relatively new to the psychology of that day. The computer was conceived of as an active participant rather than as a passive communication device. Remember that when this paper was written computers were large devices used by specialists. The age of personal computing was off in the future. Fortunately, Lick lived long enough to see much of his basic vision realized. Were he alive today, he would be seeing an even further fulfillment of that vision. Today one of the most central functions of a computer is as a communication device. I would contend, however, that Lick’s full vision of the computer as a communication device has yet to be realized. I shall return to this vision after discussing the symbiosis paper.

In *Man Computer Symbiosis* (1960), Lick chose the fig tree and the insect *Blastophaga grossorun* as his example of symbiosis. The larva of the insect lives inside the ovary of the fig tree where it gets its food. The tree cannot reproduce without the insect; the insect cannot eat without the tree. Together they constitute not only a viable, but also a productive and thriving partnership. The cooperative living together in intimate association, or even close union, of two dissimilar organisms is called symbiosis.

Actually, Lick delivered an oral presentation on Man-Computer Symbiosis in 1958. The following is a quote from that presentation as reported by Brate (2002): "That men and computers so supplement each other…and that jointly they possess the capabilities to think and comprehend, to decide upon effective action…in a way totally beyond present realization…are the primary means on which we base our hope." The following quote is from the 1960 paper, "The hope is that in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today."

Lick conceded that artificial intelligence might advance to the point where the human could no longer contribute to the relationship. Remember that he wrote this paper in the early, very heady days of artificial intelligence. This was before the Dreyfuses wrote their critiques of the potential of artificial intelligence (1972; 1986). The Dreyfuses were making principled arguments that there are limitations to what symbolic machines can do. It is interesting to note that these limitations were anticipated by Pascal[1] (1670) in the 17th century. Of course, it is ultimately an empirical question as to what computers can achieve. It is interesting to conjecture what would happen if computers achieved the potential that Kurzweil (1999) has attributed to them in *The Age of Spiritual Machines: When Computers Exceed Human Intelligence.* It might well be that if computers develop a true intelligence superior to humans that a symbiotic relationship will become more important than ever. If such computers perceive the relationship as parasitic, then we may well have the future that Bill Joy (2000) has outlined for us in "Why the future doesn't need us"!

Symbiosis is a tricky, subtle concept, particularly when it is applied to humans and technology. Clearly, a close union between humans and technology has already been achieved. It is also clear that computers cannot exist without humans, and there are areas of human achievement that cannot be attained without computers. Lick, however, was proposing something more, I believe. He was proposing something along the lines that

[1] *Mathematicians wish to treat matters of perception mathematically, and make themselves ridiculous…the mind…does it tacitly, naturally, and without technical rules* from *Pensees*.

the whole (the human plus the computer) is greater than the sum of its parts. In terms of the general linear model the equation would be

Human + Computer + human*computer = performance

Thus he is proposing an interaction term where the coefficient is positive. Some might contend that this term refers to usability. I believe that Lick was proposing more, however. I think that Lick would say that usability is a necessary but not a sufficient condition for symbiosis. He was proposing using people and computers to their best advantage and to achieve a multiplicative effect as a result of the interaction between the two.

I submit that had *Man Computer Symbiosis* (1960) been more widely disseminated and used as guidance for the funding of computer projects by the government, particularly in certain areas of imagery analysis, not only would have significant funding not been wasted, but it also would have been applied in a beneficial manner to the defined areas of need. Projects were funded to automate humans out of their jobs when what was needed was the funding of projects that enhanced the performance of humans in their jobs.

Symbiosis permeates *The Computer as a Communication Device* (1968). Curiously, symbiosis is never explicitly mentioned. Nevertheless *The Computer as a Communication Device* contains many excellent examples of symbiosis. OLIVER is one of the more mundane examples. The computer is conceived of as a communication device, not a switching device. It serves as a facilitator of the communication and sharing of mental models. The claim made at the beginning of the paper, "In a few years, men will be able to communicate more effectively through a machine than face to face." is critically dependent upon the successful implementation of symbiosis. Clearly that goal was not achieved in a few years. It would be hard to argue that it has been achieved today. It is potentially achievable, but its achievement rests upon the successful achievement of symbiosis.

It likely was apparent to Lick that the symbiosis concept had been ignored. Whether he still held out hope that it might be resurrected at a later date is not known. I submit that it is time to revisit the symbiosis concept. Not only has computer technology significantly advanced since Lick's passing, but there have also been significant and relevant developments in psychological theory. Kahneman (2002; 2003) has been one of the central actors here. He has revisited and elaborated upon the work he did with Amos Tversky by proposing two cognitive systems. Two cognitive systems were invoked in attempts to organize seemingly contradictory results in studies of judgment under uncertainty (Kahneman & Frederick, 2002; Sloman, 1996, 2002; Stanovich, 1999; Stanovich & West, 2002). System 1, termed Intuition, is fast, effortless, associative, slow-learning, and emotional. System 2, termed Reasoning, is slow, serial, controlled, effortful, rule-governed, flexible, and neutral. The cognitive illusions, which were part of the work for which he won the Nobel Prize, as well as perceptual illusions, are the results of System 1 processing. Expertise is primarily a resident of System 1. So is most of our skilled performance such as recognition, speaking, driving, and many social interactions. System 2, on the other hand, consists of conscious operations, such as what is commonly thought of as thinking. System 1 is effective presumably due to evolutionary forces, massive experience, and by constraining context. Most of the time, it is quite effective. It is using nonconscious heuristics to achieve these efficiencies, so occasionally it errs and misfires. System 1 misfires are responsible for perceptual and cognitive errors. One of the roles of System 2 is to monitor the outputs of System 1 processes. Phenomenologically this is what happens when an idea flashes to mind, but one stops to think about it. There are obvious costs to processing efficiency here, but this quality control mechanism is necessary to reduce the number of System 1 processing errors. It is worthwhile to note that Schacter in his *Seven Sins of Memory* (2001), while not invoking the System 1/System 2 distinction *per se,* was making a similar argument in that these memory sins were actually the result of adaptive processes that were the product of evolutionary forces. Anderson also made a similar argument in his *Adaptive Character of Thought* (1990).

One might conclude that this is very interesting, but what does it have to do with human/machine symbiosis? The answer is that it is the System 2 processes that require computer support, not only with respect to the pure drudgery and slowness of human System 2 processes, but also with respect to the monitoring of System 1 processes. In most cases, however, it is a mistake to assign System 1 processes to the computer. This was the fundamental error in many automatic target recognition and image interpretation algorithms that attempted to automate the human out of the loop. The perceptual recognition processes of most humans are quite good. System design should capitalize upon these superb processes and provide support to other areas of human information processing such as search (there is a tendency to overlook targets), and interpretation keys to provide a check and support for the recognition process.

It should be noted that there are System 1 processes that are fairly general across the species (e.g., fluent perceptual processes and language), and there are other System 1 processes that are specific to the particular expertise held by individuals. The model of individual expertise proposed here is that of the Dreyfuses (1986). The first stage is that of the novice where the individual is learning to recognize various objective facts and features relevant to the skill as well as basic rules for performance of a task. Stage 2 is that of the advanced beginner that is achieved after the novice has had considerable experience in real world settings and has learned to consider more context-free facts and more sophisticated rules. Stage 3, competence, comes with yet more experience and the number of recognizable context-free and situational elements present in real-world circumstances becomes overwhelming. Stage 4, proficiency, is characterized by the transition from rule-based behavior to more intuitive (System 1) processing. Stage 5, expertise, is where System 1 predominates under the watchful eye of System 2. At Stage 5 true expertise is achieved wherein the skill has become so much a part of the individual that there is no awareness of it. At Stage 5 behavior is arational. Arational behavior refers to action without conscious analytic decomposition and recombination. Performance is rational through Stage 3. That is, it is characterized by rational processing. The transition to arational behavior, and intuitive processing, occurs during Stage 4. Experts act arationally, according to the Dreyfuses. It is this expertise that Klein is addressing in his model of recognition primed decision making.

Klein (1998) has studied a wide range of expertise ranging from fire brigade commanders to chess grand masters. The fundamental process that generalizes across areas of expertise is pattern recognition. The expert recognizes a similar pattern experience in the past, which, in turn, primes a decision that leads to the appropriate course of action. This is why chess grand masters are able to play and defeat very large numbers of opponents concurrently. At each board they view, they recognize the situation and make an instinctive response. It should be noted that even though *Big Blue* has managed to beat a Grand Master on occasion, it does so on the basis of pure computing power, not on the basis of clever heuristics. Given the costs involved in developing *Big Blue*, it does not provide an example of efficient design.

There are two basic roles for computers. The role that is most commonly seen for the computer is as an information processing prosthetic. Many information processing tasks can be done faster and more accurately by a computer than by a human. Indeed, there are some tasks that are either too difficult or too time consuming for humans to accomplish. The computer should provide all the relevant tools for these tasks. Simulation tools are also needed. Klein (1999) notes that when multiple options are perceived by the expert, the expert will run mental simulations to decide upon the course of action. The sophistication of these mental simulations can be significantly enhanced with computer tools. Computers will also allow for the generation of many more simulations than a human could generate.

The second role for the computer is as a coach. This involves the monitoring of intuitive processes. Intuitive processes are those processes that either can be done better by the human or that cannot be effectively accomplished via computer. Unfortunately, this delineation of tasks between human and computer is not that simple as the intuitive processes can misfire resulting in cognitive and perceptual illusions, i.e., miscomputations of the human cognitive system. As a coach, one role of the computer is to monitor the information processing of the human and intervene when a miscomputation is suspected. Another means by which symbiosis can be achieved is through context elaboration and enhancement. Humans are context constrained, particularly with respect to intuitive processing. However, computers are, or can be, context free. By providing additional contexts, not only are the capabilities of the humans enhanced, but the likelihood of perceptual and cognitive illusions are decreased.

Context is an important concept. Communication among humans often fails due to the lack of a shared context. One can also profitably regard human/computer interaction problems as being due to a lack of shared context. Microsoft and others in the computer industry are of the mistaken opinion that improved speech recognition capabilities will make computers more usable when it is the difficulty in penetrating the logic or context within the software that is the primary problem. Having a shared context is critical to effective human/computer interaction and is, of course, a prerequisite to achieving human/computer symbiosis. Again, a critical role for the computer here is to expand the contexts in which the human is operating.

To make more concrete the concepts being discussed, a brief overview of a system being developed for analysts who deal with massive, complex, and sometimes unreliable data will be presented. The system is called MAUI NITE[2]. Key to the achievement of human/computer symbiosis is an avatar to implement the symbiosis of human and machine. The Steward Agent, henceforth referred to as Steward, serves this function in MAUI NITE. The Steward monitors the user in an attempt to anticipate the user' needs and to circumvent any shortfalls or biases in the user. The Steward stands ready to summon Staff agents, to support the System 2 (Controlled, Deliberative) Processing of the user. It is these processes for which computer tools are most needed. Staff agents, in turn, are supported by Scout agents that address the problem of filtering text, selecting a small subset of potentially relevant documents from a much larger corpus, and extracting structured information from unstructured documents (data). Computers are capable of processing much, much more data than humans are capable of processing. There is not even additivity, much less symbiosis, when data are not transformed into information. Properly designed visualization tools can help, but if the graphics are too busy, the basic problem remains the same.

Tacit knowledge can be regarded as a product of automatic (intuitive) processing. MAUI NITE tools provide an example of how a computer system can employ context to make tacit knowledge explicit. MAUI provides tools for marshalling evidence. It allows the analyst to apply tacit knowledge directly against data. When information is presented in a given way, the analyst has a tacit expectation of how information ought to behave in that context. When anomalous behavior is observed, the marshalling strategy draws the analyst's attention to facts that are potentially important. As MAUI NITE's Concept Index (CI) stores information in a way that is transparent to

[2] Model-based Agent-guided Unexpected Inferences for a Novel Intelligence Test Environment. This research has been funded in part by contract # MDA-904-C-0406 to Russell Richardson Vane, Ph.D. from the Advanced Research and Development Activity, Novel Intelligence from Massive Data Program.

both human users and software agents, it should support a wide variety of marshalling strategies.

Humans have difficulty with quantitative processes. There is a general lack of facility in computational reasoning. The Steward uses a cognitive, stylized form of uncertainty to make decisions algorithmically. This algorithm, called Quantitative Option Assessment (QOA), enables a software agent to choose among competing hypotheses about a current or future situation.

The Steward has access to other tools for supporting the controlled, deliberative processes of the user. ASSET (the Argument Structuring, Supporting, and Evidence Tool) assists the intelligence analyst in building and critiquing arguments. ASSET complements the System 1 (automatic, intuitive) processing of the analyst. The analyst might be good at quickly generating an intuitive hypothesis that apparently works. However, this facility might result in failing to generate or consider other viable hypotheses. The intelligence analyst is able to construct explanation-arguments, exception-arguments, marshaling-arguments, and novel-arguments using ASSET:

- *Explanation-arguments* detail what the analyst may present to others about his conclusions and become a conclusion, if adopted, at the end of an assigned task.
- *Exception-arguments* are those caveats about any explanation argument that bounds the explanation-argument's context and checks whether things are "normal." An example of one exception-argument to "People who carry large quantities of money are usually criminals" is "unless they are making a policy statement against credit cards."
- *Marshaling-arguments* are constructed to piece together evidentiary combinations that often become a standard view of the information, such as timelines or radial-distance-from-a-location.

While the developers have other mechanisms to bootstrap and update MAUI NITE's knowledge bases, novel-arguments are the primary way that new knowledge is added by the analyst to the system.

Staff agents construct exception-arguments and marshaling-arguments to help the analyst track down the truth. Exception-arguments are derived from the syntax and semantics of an explanation-argument. Marshaling-arguments are template filling arguments made from the evidence by applying standard causal and ontological patterns such as knowledge concerning time, geo-location, and physics. While not solving *common sense* reasoning, the Staff agent is supposed to be making research strides in the practical application of numerous kinds of heuristic, domain knowledge.

The Steward needs to be able to monitor the analyst during task performance, alert the analyst, and communicate with the analyst. One of the Steward's roles is to monitor the analyst's System 1 (automatic, intuitive) processes to assure that they are not going awry. It was a design goal that the Steward would not *bother* the analyst, while providing value to the analysis activity. A self-levied requirement that MAUI NITE measure the appropriateness of its alerting process was imposed.

The Steward has two primary mechanisms for alerting the analyst: a confusion alert and a salience alert. The confusion alert is meant to notify the analyst as to an inordinately high amount of Steward uncertainty about what the analyst is doing. The salience alert aims at notifying the user of a productive staff agent finding related to the active task, or in the case of temporary idleness, of any task.

The Steward has a number of mechanisms for communicating with the analyst: passive, provide url links to the analyst; semi-active, via alerts and the task panel; and active. The active interchanges occur between the agent and Steward visualization panel. Eventually, Steward will comment about analyst created arguments using ASSET. This explicit, stylized conversation will be used to share arguments and on-going task progress with other analysts' Stewards and ultimately even other analysts.

The current version of MAUI NITE has the Steward indefatigably monitoring for shortcuts that might be mistakenly made during analysis. To do this a stream of keyboard and mouse events must be sent to the Steward. Higher level or contextually relevant information, such as file open and window events, are important. The Steward takes advantage of the fact that most analysts have to manage screen real estate directly by windows related activities. In the event that an analyst might have 2, 4 or even eight monitors this becomes a progressive weaker assertion. In the current version, the Steward is primarily concerned with the stage (Define, Search, Marshall, Judge, and Present) of the analytic process the analyst is in, so that appropriate tools and assistance can be offered to the user. When the Steward is confused about the stage of the analyst, it can query the analyst with a confusion alert. The analyst sets the sensitivity of the Steward Agent to assure that the Steward does not become annoying.

Consider the prospects when the MAUI NITE concept is expanded to teams of analysts. Here the Steward can serve as a facilitator not only between the computer analyst, but also among teams of analysts and their computers. The Steward could serve as a facilitator among the different systems, each with their own resident sources of symbiotic expertise. At this point, the assertion made in *The Computer as a Communication Device, i.e.,* "In a few years, men will be able to communicate more effectively through a machine than face to face." will appear to have been relatively modest.

It is interesting to speculate what the nature of the interaction would be in a highly symbiotic system. The interesting problems are those that are open ended and deal with uncertainty. For these problems there is no *a priori* correct solution. The correctness of the solution awaits some outcome or series of outcomes. Suppose that the human has a strong hunch as to the outcome courtesy of System 1 processing. However, the symbiotic counterpart has offered a different, or perhaps several different alternative solutions. So what does the human do? Go with the hunch or accept, largely on faith, an alternative offered by the symbiotic counterpart. Myers (2004) *Intuition: Its Powers and Perils* provides a splendid review of the general problem, whether to accept System 1 processing or whether to subject the problem to further consideration. An analogous dilemma has already appeared in mathematics when computers are incorporated into mathematical proofs. The proof is too difficult to formulate without the aid of the computer. That being the case, how can it be checked adequately? A certain element of faith is involved. This is not unusual in everyday life as we know many things that we cannot explain. Sometimes the explanations were never known. Sometimes they were learned in school but forgotten. Although the risk is one of an infinite regress, intuition about intuitions needs to be developed. Klein (2003) contends that intuition can be explicitly developed and has developed training programs to that end. One option that can be explored in the symbiotic computer situation is that simulations can be run regarding the different options, so a choice can be made on the basis of risk, award, or some cost/benefit function.

If there were one word to describe Lick's contributions to engineering psychology, what would that word be? I would submit that that word would be "vision." Of course, that vision goes well beyond psychology, but that is what engineering psychology implies. There are applications. And in Lick's case, these applications are considerable. Unfortunately, it would be appear that "vision" is in short supply in the engineering psychology of today. Engineering psychology needs "vision." "Vision" will provide the intellectual excitement to attract the best minds to the field.

But how can "Vision" be achieved? "Vision" requires imagining and conjecturing about the future. In my view, there is a natural affinity between engineering psychology and futurism (Griffith, 1999). Even if one does not formally identify oneself as a futurist, one needs to be interested in the potential technological developments of the future. Otherwise, engineering psychology remains in a reactive mode. It needs to operate in a proactive mode.

Moreover, this "Vision" needs to be interdisciplinary. By definition engineering psychology is interdisciplinary. Remember that not only did Lick work in interdisciplinary settings, he also had academic appointments in engineering departments. It is a tad ironic that relatively little of the research reported in our journals is interdisciplinary. How many Division 21 members work in an interdisciplinary context or work with colleagues from another discipline? A worthwhile goal for professional development is to expand the disciplinary diversity of one's professional associates. I enjoy coming to meetings such as APA to enjoy the companionship of fellow psychologists and to learn about what they are doing. However, I work more productively in the company of engineers, computer scientists, mathematicians, and subject matter experts.

We also need to be proactive in promoting this vision. It does little good to complain that the discipline is unknown or misunderstood. Communicating a new vision is difficult. It requires one to be not only proactive, but also persistent.

A complementary question is whether these applications will benefit psychology or is psychology simply being used for the benefit of technology. I would argue that experimental psychology would also benefit. Symbiosis requires the development and refinement of good theories and models of human cognition. Good theory and models are central to the success of the applications of engineering psychology, and they can be developed as a part of applied work. Historically experimental psychology has employed artificially generated stimuli (e.g., the nonsense syllable) and research paradigms (e.g., serial and paired-associates learning) because these artifices were necessary to understand the underlying processes. Subsequently, it was found that experimental participants worked to make these artificial tasks meaningful. Little was being learned about these underlying theoretical processes. Research paradigms were abandoned because they lacked ecological validity. There is no reason why psychological theory cannot be developed using real tasks. Thus it is possible, indeed desirable, to address theoretical and applied issues simultaneously. I would argue that in experimental psychology, at least, the basic/applied distinction is, at best, artificial, and at worst, one that impedes true and lasting developments in psychological theory. Experimental Psychology has produced research that, while promising at the time, was subsequently found to be of little value. This point was well argued by Newell in his paper, “You Can’t Play Twenty Questions with Nature and Win” (1973). Applied psychology should keep psychology on track and relevant. It mitigates or eliminates the chasing of chimera.

Let us return to the question posed in the title, “What would Lick think of engineering psychology today? My guess is that he would say, “you’re doing a great job, but you need more vision, more excitement. Vision will provide the intellectual excitement to attract the most creative minds to the Division.” Of course, I am putting words in Lick’s mouth. Make your own judgments. It is worthwhile to reflect upon this question. I propose that, at a minimum this question should be asked on Lick’s birthday along with a review of his career and his accomplishments. Remember that Lick was born on March 11, 1915. So let me end by wishing a belated, or a very early, “Happy Birthday, Lick!”

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