Evaluation of Knowledge*

Which the Forest, Which the Trees?

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The evaluation of knowledge in its ultimate sense is an unattainable goal.
Evaluation itself generates new knowledge which requires evaluation. The issue
was drawn when two people looked at an apple in the Garden of Eden. Fortunately,
the Workshop Committee instructed its speakers to define their own domain, thereby
releasing us from consideration of insoluble problems. Therefore, I shall first outline
some common practices in the evaluation of knowledge I have chosen not to discuss.

These include written examinations in any form, despite their many adequacies,
limited variables, and the hazard they harbor of testing inert but negotiable information
recall.

I have chosen not to discuss oral examinations. These, too, have advantages and dis-
advantages stemming from their great flexibility and limited objectivity.

I have chosen not to discuss talent scout techniques, either, even though this evaluation
mode has been utilized effectively in sports, the performing arts, business, and to
extraordinary advantage by the Rockefeller and Markle Foundations. Its essence is a
subjective evaluation of a man's style and personal characteristics after his professional
career has attested to his knowledgeability and capability for productive performance.

Make no mistake; I am convinced that each of these mechanisms serves us well in
limited environmental sets when their application is carefully planned and judiciously
exercised toward achieving a degree of evaluation of precisely defined, appropriate, and
limited goals. They most commonly fall short, even of this limited mark, when the
goal for which they have been designed has

been ill-defined or has changed unnoticed in the course of time.

There are two reasons for my not dwelling on testing methods. First, to do so would be
to discuss material already well developed by Dr. Levit. For me to say more would suggest
shipping owls to Athens. Second, I am convinced that to do so would not lead to more
fundamental considerations.

When this assignment first developed, I accepted with enthusiasm. This soon cooled
when I began to realize that I had developed a concern for the topic but no approach to
realistic proposals. And so, I pursued old avenues, and some new. I reread
Whitehead, Cushing, and particularly Sir Karl Popper. Gradually it became clear that
moments of vision had not come to neurosurgery by way of testing methods or inductive
inference. High moments in neurosurgery and many other disciplines have more
often evolved from quite another direction, one which we often neglect in our preoccupa-
tion with testing methods and complex observations bent on the collection of mass
data.

I have chosen this morning, therefore, to suggest that we now reconsider an approach
to tentative solutions for this problem. Hopefully this approach will help usformu-
late practical solutions.

Let us see how we come out if we attack the matter by "conjecture" and "refutation." I
have taken these terms from Karl Popper’s lectures. But they are not unique. They ap-
pear frequently in a variety of forms in literature pertaining to scientific and medical
education in recent years. What do they imply?

In essence, they stand in opposition to inductive reasoning, considered still by many
to be the keystone of scientific method. They stand in opposition to observational systems
wherein a series of events or beliefs appear to establish consistent reiterations of similar

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experiences which gradually acquire the cloak of validation by repetition; while, in fact, the hundredth, or the thousandth, repetition has in no way been tested and found to be more, nor less, valid than the first. This was characteristic of astrology and phrenology and the Marxist dogma of social history. Such systems merely indicate that almost any observation can be interpreted in the light of a theory based on a sequence of observations. Albert Einstein, cognizant of the limited nature of theory, once held that "there could be no fairer destiny for any theory than that it should point the way to a more comprehensive theory in which it lives on as a limiting case." Such a theory as this, of course, must be testable and falsifiable to the end that it be discounted, modified, or stand until an adequate test is devised that will demonstrate its limited nature.

A statement or system of statements which is construed to represent a theory must be sufficiently precise to be capable of "conflicting with possible or conceivable observations." The role of observation is to confront a precise proposition. To establish an observation alone without a precise problem is an absurdity. If I ask you now, as you sit here, to take pencil in hand and carefully observe and write your observations, you will look incredulous, asking, "observe what?" or "whom?" You would seek the precondition toward which the observation is intended to have relevance.

First, then, must come a theory, mythological or scientific, but still, a theory. Then there are two options. First reiterate experience and observation, some clever and sophisticated but predetermined to be interpreted as reinforcing the validity of the stand we have taken. Second devise observations contrived as attempts to refute or falsify the theory which we initiated as a tentative and testable statement of belief.

No more rational course is open to us than to rely for practical purposes on well-tested theories, even though we may know them to be subject to further testing and to be, in some degree or fashion, imprecise.

Anticipating the qualified nature of theory, it is imperative that we maintain a constructive attitude toward errors as they emerge. Only such an attitude will make it possible for us to obtain flexibility and to survive the "elimination of an inadequate hypothesis." Otherwise, such a thesis may survive while we and our effort succumb to real issues. There is a touching story of an Indian community which disappeared long ago because of its belief in the holiness of life, including that of tigers.

The actual procedure of science, Popper argues, is to "operate from conjectures: to jump to conclusions." Observations and experiments function as attempted refutations of our conjectures.

There is a proverb about the difficulty of seeing the wood for the trees. The problem is exactly this: see the wood, and test by attempted refutation our perception of the wood by means of the trees.

Now, you say, how does this pertain to our evaluation of knowledge. You will argue that, "The flour is the important thing, not the mill; the fruits of philosophy, not the philosophy itself. . . ." But to have better flour we may need new mills; to have improved fruit may require a change of philosophy.

What I am suggesting is this: that we determine a priori criteria, conjectures pertinent to the evaluation of knowledge in neurosurgery. Then, develop experimental models for their evaluation. The models will aim at refutation of the conjectures, in the expectation that constructive adaptations may be realized. Initial theoretical systems will not, we may be sure, fulfill criteria relevant to the public weal at the turn of this century unless they are constructed with systems for refutation and thereby adaptation.

But I must be specific. Who must engage the effort? We must. While there is little time, there is much fine literature to guide us. Neurosurgeons in a state of critical self-evaluation, attempting to refute conjectures of the past and practices of the present, must assume the primary responsibility for this difficult task. Harvey Cushing once said, "The presence on a faculty of a single person of character, ability, and the right personality may serve . . . to bring the reputation of a school into flower. . . ."

What is the focal point at which we must direct such matters? Cushing implied and Whitehead stated clearly, it is the school and not the teacher; it is the school and not the student; it is not government; it is not exter-