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RICHARD HOLLINGSWORTH
Florida State University

The Polynomial Law

We were very impressed with Professor Sue Doe Nihm's (November 1976) polynomial law of sensation, which states that the degree of the polynomial is always one less than the number of stimuli. However, a distinguished visitor to our university, Professor Hoff Witt of the Frohliche Hochschule, has found that the law applies not only to psychophysical data but to psychological data in general. In recognition of Professor Witt's generalization of Nihm's law, we hope other psychologists will join us in referring to their joint contribution as the Nihm-Witt law of just enough numbers. The important implication of this law is, of course, that psychology's promise has been fulfilled. We now have a single law descriptive of all psychological data. The work of Professor Nihm and Professor Witt, as well as our own work, has convinced us that no single psychological law will ever be more powerful.

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DOUGLAS K. DETTERMAN
STEPHEN K. REED
Case Western Reserve University

Nihm Refuted

I have read with interest the article by Sue Doe Nihm (November 1976) entitled "Polynomial Law of Sensation." Since I did not follow her arguments very well, I gave the article to a professor of mathematics, who commented as follows:

It surely is possible to fit almost any data with a polynomial. The polynomial fit, however, obscures the basic relation between the variables. It is of course the basic relations we seek.

Nihm needs to be educated in science and mathematics. Her claims are either vacuous or preposterous; for example, (1) to say that laws of physics are often polynomials is like saying numbers are often integers, and (2) the coefficients in the equation $H = a_0 + a_1t + a_2t^2$ (p. 809) have definite significance. This equation comes from Newton's law of motion: $F = ma$, and a_0 , a_1 , a_2 are precisely related to initial and other conditions according to this fundamental law. This work is meaningless.

REFERENCE

- Nihm, S. D. Polynomial law of sensation. *American Psychologist*, 1976, 31, 808-809.

JACK TOMLINSON
Department of Biology
San Francisco State University

Nihm's Law Only Perfect on the Average

Any theory which not only claims to fit the data better than existing laws but obtains a perfect fit every time should call forth a certain amount of skepticism in the mind of any critical reader. Nihm's (November 1976) polynomial law of sensation makes

such claims and thus deserves severe scrutiny.

Small differences in Pearson correlation coefficients may represent large deviations of the data from the model. For example, the integers from 1 to 9 correlate .955 with their logarithms, .999 with their square roots, and .975 with their squares. These correlations are well within the range of values obtained to measure the fit of the power function to data. Therefore, any discrepancies from a perfect correlation may represent serious problems for the polynomial law!

Thanks to the kindness of Sue Doe Nihm, who forwarded all of the previously published psychophysical data, and Barbara Mellers, who carried out the reanalyses using an HP-21 calculator, I have taken a closer look at the fit of the polynomial function. Correlations that were reported as perfect actually ranged from .999997 to 1.000002. On the average, the correlation was 1.000—but not for any given data set. These findings contradict Nihm's results and may be extremely important!

Hence, the polynomial law of sensation does not rule out other possible theories. Despite the elegance and simplicity of Nihm's law, sensation is not *always* a polynomial function of physical intensity, although the average correlation of the theory with the data is 1.000.

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- Nihm, S. D. Polynomial law of sensation. *American Psychologist*, 1976, 31, 808-809.

IMA GÖST RYETA
Löchnessan Universitet

Sue Doe Replies

I was saddened to see that Nihm's law is regarded as "meaningless" by a professor of mathematics. I have given a copy of Tomlinson's letter to a mathematics professor on our faculty here who has confirmed my

results analytically. He concluded that my work was brilliant and true. He also said that Nihm's law could have been proved without recourse to data (I don't know how he can say this!) if a function relates sensation and physical value. He could not understand why a mathematics professor would regard *a priori* truth as "vacuous" or "preposterous."

I was gratified to read Ryeta's discovery that the polynomial law occasionally exceeds perfection! I have not previously seen this claim and I intend to carry out further research to see if it can be replicated, once I obtain a calculator of this type.

I have received many letters praising my work, encouraging me to publish details of the analyses, or suggesting I extend Nihm's law to other areas of psychology. I have also received numerous criticisms from persons who doubt that the same type of function characterizes the relationship between physical measures and subjective value for all situations, or who doubt the scientific value of finding this function in the absence of a testable theory. I don't know why these criticisms are leveled only at me and not also at the other psychophysical laws.

SUE DOE NIHM
Chang Ri Law University

Earlier Cognitive Theorists

In reading Dr. McKeachie's (December 1976) Presidential Address, I was quite excited to see him approaching the area of modern cognitive psychology and giving it what I felt to be its just due. My excitement rather rapidly turned to incredulous disbelief as he discussed Schacter's and Kiesler's cognitive theories of emotions as new theories and totally ignored the work of Albert Ellis (1961, 1962), Magda Arnold (1960), and many others that preceded this by over 15 years. While I do not deny that Brim and others have strongly contributed to the theoretical constructs, it would

appear that they have simply restated what had been said many years before by Ellis.

I considered, but discarded, the possibility that Dr. McKeachie may not know Dr. Ellis or of his works—I think everybody in the APA knows Albert Ellis. Therefore, I must necessarily wonder why the seminal work in the area of cognitive behavioral theories of emotion by this eminent American psychologist has been so completely ignored and why the profession chooses not to give him the recognition that he so justly deserves for maintaining, against all sorts of criticism, derision, and argument, his efforts to present cognitive behavioral theory to the world.

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ALLAN F. DEMOREST
Fort Dodge, Iowa

Epstein's Self-Theory Undergoes an Identity Crisis

In a paper initially presented as an invited address to the Canadian Psychological Association Convention in 1972, and subsequently published in the *American Psychologist*, Epstein (1973) proposed that the self-concept can profitably be reconceptualized as a personal self-theory, and that when this is done, a number of problems can be solved within an objective, scientific framework that should be acceptable to objectivists and phenomenologists alike. Thus, the executive self, which James and Allport had banished to the realm of philosophy, can be accounted for by the observation that all theories influence as well as are influenced by

the accumulation of knowledge. The concept of a growth principle can readily be explained by noting that theories grow with exposure to new data. Epstein noted that a personal self-theory is not a mystical concept corresponding to a soul or a "homunculus" residing in the head, but is an integrative conceptual system with the following aims, which sometimes conflict with one another: (a) to assimilate the data of experience, (b) to maintain a favorable pleasure/pain balance, and (c) to maintain self-esteem. Disorganization, as in acute schizophrenia, can be accounted for by the collapse of a self-theory that has been invalidated or is otherwise incapable of fulfilling its functions.

Recently, Epstein's own personal self-theory has undergone stress from exposure to data difficult for it to assimilate within the constraints of reality. Namely, Epstein read McKeachie's (December 1976) Presidential Address to the APA, with which he was in enthusiastic agreement until he came upon a passage singing the praises of Brim for having, in an oral address in 1975 in Surrey, England, "*introduced* [italics added] into personality theory a concept of the self that . . . suggests that behavior is determined not only by our internal models of the environment but also by an internal model of one's *self* [original italics] in relation to the world. We have sometimes thought of the self as a small *homunculus* [italics added] inside the head. Brim suggests that it would be more useful to think of the self as a *theory* [original italics] we have about ourselves" (McKeachie, 1976, p. 828). For a moment, Epstein experienced an identity crisis. He was sure he was not McKeachie, but he was not sure if he were Brim or if Brim were he. Fortunately, Brim was kind enough to forward a reprint of his paper (Brim, 1976), which helped to clarify matters. Brim had acknowledged Epstein's contribution in a footnote, complete with a quotation, but he had neglected to note in the body of the paper which ideas were Epstein's