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This Week's Citation Classic

Swets J A, Tanner W P Jr & Birdsall T G. Decision processes in perception. *Psychol. Rev.* **68:** 301-40, 1961.

The human observer is regarded as a rational decision-maker, one appropriately influenced by stimulus probabilities and response utilities in acting on sensory data. A new analytical technique isolates the effects of such decision variables to yield pure measurements of sensory capacity. [The *Science Citation Index*® (*SCI*®) and the *Social Sciences Citation Index*™ (*SSCI*™) indicate that this paper has been cited 289 times since 1961.]

John A Swets
Bolt Beranek and Newman Inc
50 Moulton Street
Cambridge. MA 02138

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"This paper proposed and supported a new theory of human sensory discrimination The theor\ carried with it a solution to a long-standing analytical problem in psychophysics the discipline concerned with the measurement of sensors capacity.

"Spike Tanner and I were graduate students in psychology at the University of Michigan in the early 1950s, whose common interests included mathematical approaches to the study of sensory processes In pursuit of this interest we teamed up with two graduate students in engineering. Wes Peterson and Ted Birdsall, who were studying electronic sensing devices Tanner, in his late 30s at the time, died this past summer after an influential teaching and research career in Ann Arbor Birdsall too remained at Michigan and continues, on the side, to co-author articles with psychologists.

"The dominant sensory theory over the years was that human discrimination capacity is determined, in an all-or-none fashion, by a physiological threshold But also apparent through the history of psychophysics was a view that sensory information is continuous, and that an observer must therefore deliberately select a Criterion amount of apparent difference for re porting the existence of a physical difference A related concern was that this criterion might be so variable as to confound attempts at precise and reliable sensory measurement. The key analytical insight of our engineer colleagues was that a particular transformation pi the operating characteristics, as developed in statistical theory, serves to separate whatever response criterion might be adopted for or by a sensor (receiver, observer) from that sensor's fundamental capacity to discriminate The receiver operating characteristic provides independent measures of sensory capacity and the extrasensory criterion.

"The difficulties we experienced in publishing the paper probably resulted from the strong suggestion that a venerable theory be discarded, with the proposed replacement seeming to come from left field In any event it is wryly amusing in the present context to recall that the paper spent five years in the review process of one journal before it was submitted to the Journal that published it.

The admission that the paper dealt with a problem in psychophysics would have suggested to psychologists at the time that the paper would receive very few citations even if it were tremendously influential in its field, because that field was quite generally viewed as a dustbowl in psychology According to William james, indeed, its literature was thorough, subtle, and dreadful, and it all amounted to just nothing However, the demonstration that the human observer runs his sensory inputs through a rational decision process on the way to response, in even the simplest discrimination task, seemed to stir a wider interest—eg, among the budding cognitive psychologists of the day Moreover, with a solution available, the existence of the criterion problem' became more evident in other traditional areas of psychology as in the study of memory.

"In more recent years, another line of extrapolation has appeared It happens that the fundamental analytical problem turns up in a variety of practical settings in which an evaluation is sought of the performance of a man, machine, or man machine system Though the statistical ideas might have traveled a more direct route, their use in psychology has been credited in their applications to industrial monitoring and quality control, information retrieval systems, forensic situations, aspects of transportation, and medical diagnosis.