

This Week's Citation Classic

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Seligman M E P. On the generality of the laws of learning.
Psychol. Rev. 77:406-18, 1970.
[Dept. Psychology, Cornell Univ., Ithaca, NY]

Organisms are evolutionary prepared to associate certain events with each other, unprepared for some associations, and con-traprepared for others. The taste aversion literature challenges the general process learning assumption that all events are equally associable and obey common laws. The laws of learning may vary with preparedness and different physiological and cognitive mechanisms may underlie the dimension. [The *Science Citation Index*[®] (SCI[®]) and the *Social Sciences Citation Index*[™] (SSCI[™]) indicate that this paper has been cited over 300 times since 1970.]

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"Sauce bearnaise, an egg thickened tarragon-flavored sauce, used to be one of my favorite foods in the world. One evening, in 1966, I had sauce bearnaise on filet mignon. About six hours later I began to throw up and spent the next several hours retching. After that, sauce bearnaise tasted foul to me.

"How could such learning have taken place? At first glance it seemed to me like an instance of Pavlovian conditioning with the conditioned stimulus (CS) being the sauce; the unconditioned stimulus (US) being illness; the unconditioned response (UR), throwing up; and the conditioned response (CR), nausea and the foul taste of the sauce. But cursory examination of what I knew about Pavlovian conditioning suggested that my taste aversion violated five basic assumptions of general process learning theory. 1) Learning took place with a *six-hour delay* between CS and US, and this never occurs in the laboratory. 2) The learning was *selective*. Only the sauce, and not the filet mignon nor the white plates from which I ate, became aversive. 3) The phenomenon was *robust*. It has lasted 13 years. Normal Pavlovian conditioning, in contrast, extinguishes readily. 4) The phenomenon was *not cognitive*. I found out that the stomach flu was going around and therefore 'knew' that it wasn't the sauce that caused the

illness. In spite of this cognition, my aversion remained. In contrast, having the relevant expectations that the CS will no longer be followed by the US is a clear in stance of inhibitory conditioning within the Pavlovian laboratory. 5) It made *good evolutionary sense* that taste should be selectively associable with illness, whereas promiscuous Pavlovian conditioning makes no evolutionary sense at all.

"Within a few weeks after the sauce bearnaise phenomenon, John Garcia published his (truly) classic article upon which my review was parasitic. Garcia demonstrated that when rats were X-rayed following a compound CS of light, noise, and taste, they learned to stay away only from the taste, and learned no aversion to the light and the noise. He also showed such learning over very long delays.¹

"My review was an attempt to highlight these developments in taste aversions and to integrate them into learning theory. In general, I intended it as an experimentally based attack on the *tabula rasa* principle. This was highly unpopular at the time, and Garcia, Paul Rozin, I, and others took considerable flak from traditional learning theorists. One major learning theorist said of Garcia's findings, 'They are no more likely to be true than you would find bird droppings in a cuckoo clock.'

"The claim that natural selection might have influenced associability itself did not fall on wholly deaf ears, however. Younger learning theorists, ethologists, and cognitive psychologists under Chomskian influence found the claim congenial, if a bit ill-defined.

"In spite of its high citation rate, I count the article a failure. I had hoped that a new research strategy might emerge in which investigators looked for *differences* between associations depending on the species, the niche, and the stimuli. But this has not happened. The research that followed this article has concentrated on the *similarities* across species and niches. Even though my review is often cited, it is usually to pay lip service to an evolutionary influence on learning, but it has not deeply influenced the research practices of the field. A more recent review of the subject has been prepared by A. W. Logue.²

1. Garcia J & Koelling R . Relation of cue to consequence in avoidance learning. *Psychonomic Sci.* 4:123-4, 1966.
2. Logue A W. Taste aversion and the generality of the laws of learning. *Psychol. Bull.* 86:276-96, 1979.