

achieving this goal, and in achieving the more ambitious and productive goal of integrating the social and natural sciences, because it does not identify the modern theory of adaptation by natural selection as the core integrating principle. Integration would be better accomplished by the non-zoocentric adaptationist framework that already exists (Darwin 1859; Haig 2003; Hamilton 1964; Tooby & Cosmides 1992; Trivers 1971; 1972; 1974; Williams 1966), and it is not clear that BPC contributes to the progress that this framework continues to make.

## Information processing as one key for a unification?

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**Abstract:** The human information-acquisition process is one of the unifying mechanisms of the behavioral sciences. Three examples (from psychology, neuroscience, and political science) demonstrate that through inspection of this process, better understanding and hence more powerful models of human behavior can be built. The target method for this – process tracing – could serve as a central player in this building process of a unified framework.

The unification of different scientific disciplines such as economics, biology, psychology, and political science under the rubric of the “behavioral sciences” can ultimately provide a better understanding of human beings’ cognition, behavior, and interactions. Based on Gintis’s framework in the target article, questions would be asked differently, and their answers would have a broader impact. Such a unification demands the rethinking of theoretical and methodological issues in each of the affected disciplines. In this commentary I argue that the detailed inspection of the human information-acquisition process in different disciplines helps in building such a framework. In particular, process tracing can serve as a central method in this endeavor.

*Process tracing* has been primarily studied in the psychology of decision making (Ford et al. 1989) and uses different methods for recording what information is attended to and when that attention occurs and shifts. Thinking aloud, eye tracking, protocol analysis, and information boards are common methods. They rest on the assumption that the recorded information-acquisition steps resemble closely cognitive processes within the human brain. A substantial body of evidence (Harte et al. 1994; Payne et al. 1993; Russo 1978; Schkade & Johnson 1989) has been developed over the last 20 years to support this claim. Here I will highlight three examples from different domains to show how process tracing methods have been used and what benefits arise in comparing to more traditional input-output models.

The first example uses an information board approach to find underlying patterns in information acquisition when simple gambles are used. Brandstätter et al. (2006) suggested a simple descriptive model of people making decisions between two gambles (with two and five outcomes). This method, called the Priority Heuristic (PH), sets the focus (for two-outcome gambles, in decreasing order) on the minimum gain, probability of the minimum gain, and the maximum gain. Using the PH, the authors predicted choices given the use of the heuristic, and prescribed in detail the sequence in which the different items should be accessed. Johnson et al. (under review) compared the process steps of the PH with their observed usage in a process tracing study using the same gambles. It becomes clear when the data of this study are inspected that there are some predictions of PH actually met in the process data; for example, more attention

is set to gains in a first reading phase than to probabilities. However, there are several predictions which do not hold when the process level is examined. One of the stronger predictions PH makes is that there should be no transitions between gains and their corresponding probabilities. However, in the Johnson et al. data, this is the most frequent transition found across the different gambles and can be interpreted as integration of the gain-probability pairs into an expected value.

The second example brings us into the domain of neuroscience. Fellows (2006) used an information board approach to identify differences in information-acquisition strategies in a group of participants with damage in the ventromedial frontal lobe (VFL) in comparison with a healthy group (as well as with a frontal lobe-damaged group where the VFL was still intact). Strong differences between the VFL and the control groups were found in terms of which strategy was used to gather information. Generally, a preference for attribute-based search strategies was found. In the VFL group, a different pattern, with dominating search in alternative-based order, resulted. One important detail of this study is that the absolute amount of information and the time taken to come to a decision were the same in both groups – nevertheless, the underlying strategy in information acquisition differed strongly.

The third example demonstrates the usage of process tracing techniques in the political sciences. Redlawsk (2004) examined the information search process of voters in an election experiment. Because of the dynamic structure such an environment has, a modified version of an information board study was used. In this dynamic information board, cell content is updated during the information search process. This means that the participant has to make two decisions – first, which information is of interest and, second, when is the right time to access certain information. Redlawsk compared a static information board with a dynamic one and found a switch from compensatory to non-compensatory strategies with an increase in complexity. Additionally, more information was acquired for the finally chosen candidate in comparison to the rejected one. Both findings will not surprise scientists working with process tracing, because they are well documented in many studies in this field. The lesson from this study is the applicability of the method in a very different domain than is generally used in decision-making studies – the domain of political science and policy building.

The points I want to make with these examples are twofold. First, the three studies show that despite the different perspectives on human behavior, at least some approaches in psychology, neuroscience, and political science use the same methods to gather insights into human information acquisition. However, the adaptation of new methodologies from other areas often takes a long time, and one should be aware that the cited studies (despite their quite recent publication dates) refer to methods that have existed in psychology for more than 20 years.

The second point is that better models of decisions can be built when the input-output level is left and the process actually happening during the information-acquisition phase of a decision is examined. Put simply, process models of human decision making require process data. Using process methods, we can learn when and where the participant sets her focus in her information search through the timing and number of acquisitions of particular information items. As such, we can get closer to underlying processes in the brain when we observe transitions between information items. All of this information would be unavailable if the level of data collection were confined to only the responses of the participants – that is, to their final choices. The wealth of information participants emit when thinking and deciding is valuable, and perhaps critical, in developing unified models in all of the behavioral sciences.

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