

## PHIL 5983: Rationality Seminar

University of Arkansas, Fall 2004

**Topic:** More Moderate Responses to Tversky and Kahneman, from Psychology

**Readings:** *Simple Heuristics* (Chapter 1); Kahneman and Tversky “On the Reality of Cognitive Illusions”; and Gigerenzer “On Narrow Norms and Vague Heuristics: A Reply to Kahneman and Tversky (1996)

*Simple Heuristics* (Chapter 1)

\*The heart attack evaluation example.

--Moral: “The more general form of this counterintuitive finding—that fast and frugal decision making can be as accurate as strategies that use all available information and expensive computation—forms one of the bases of our research program.” (5)

Ecological rationality: “rationality that is defined by its fit with reality” (5)

\*The two revolutions:

1. A world of uncertainty and the rise of probability theory.
2. Fast and frugal heuristics as a good real world solution to problems in this uncertain world.

--Part of Gigerenzer’s project is descriptive—that we actually reason according to these heuristics:

“Our premise is that much of human reasoning and decision making can be modeled by fast and frugal heuristics that make inferences with limited time and knowledge.” (6)

\*Gigerenzer’s fourfold taxonomy of theories of rationality, as depicted on p. 7. The key distinction here is between *bounded rationality* and *demonic* (e.g., LaPlace’s superintelligence) views.

--Darwin’s deliberation over whether to marry provides fodder to explain these 4 varieties.

1. LaPlacean (unbounded) strategy—maximizing subjective expected utility  
Problem: “...when it comes to how they think these uncertain inferences are executed, those who believe in unbounded rationality paint humans in God’s image. God and Laplace’s superintelligence do not worry about limited time, knowledge, or computational capacities. The fictional, unboundedly rational human mind does not either—its only challenge is the lack of heavenly certainty...

The greatest weakness of unbounded rationality is that it does not describe the way real people think.” (9)

## 2. Optimization under constraints

--2 kinds of information search: internal (memory) and external (environmental). (10)

--Optimization under constraints employs the same general strategy as above, but adds a search *stopping rule*, in appreciation of our *finitary predicament*.

“The models in the class we call “optimization under constraints” assume that the stopping rule optimizes search with respect to the time, computation, money, and other resources being spent. More specifically, this vision of rationality holds that the mind should calculate the benefits and costs of searching for each further piece of information and stop search as soon as the costs outweigh the benefits.”

(10)

--But, calculating the costs of future search is even more computationally taxing than the LaPlacean strategy.

--Gigerenzer claims that this strategy should not even be a normative goal. (11)

--Note how Gigerenzer is careful to distinguish optimization under constraints from bounded rationality.

## 3. Satisficing

“Simon’s vision of bounded rationality has two interlocking components: the limitations of the human mind, and the structure of the environments in which the mind operates.” (12)

“...environmental structure, is of crucial importance because it can explain when and why simple heuristics perform well: if the structure of the heuristic is adapted to that of the environment ... The general point is that to understand which heuristic an organism employs, and when and why the heuristic works well, one needs to look at the structure of the information in the environment.” (13)

--‘Ecological rationality’ is supposed to emphasize this second component of Simon’s account.

Satisficing: “Satisficing takes the shortcut of setting an adjustable aspiration level and ending the search for alternatives as soon as one is encountered that exceeds the aspiration level.” (13)

--Gigerenzer complains that even satisficing requires (or *can* require) too much computation (of a standard and evaluating each alternative to that standard).

## 4. Fast and frugal heuristics

--No rigorous definition is provided in this section. Instead we are told: “Fast and frugal heuristics limit their search of objects or information using easily computable stopping rules, and they make their choices with easily computable decision rules.” (14)

--An advantage this has over its more computational rivals—the alternatives (especially demonic theories) assume that various alternatives can be evaluated according to a common metric (e.g., utiles) but this is unrealistic or simply false because of incommensurability.

\*Gigerenzer's project goes well beyond our primary interests (as philosophers) in a normative theory of rationality. Gigerenzer argues that fast and frugal heuristics describe our actual reasoning processes, and can also be used to construct artificial reasoning systems.

\*A New Research Program: "The different stages of this research program rest on multiple methods, including theoretical modeling of heuristics, computer simulation of their performance, mathematical analysis of the fit between heuristics and specific environments, and laboratory experimentation." (16)

\*3 parts (or steps) to a heuristic:

1. Search-guiding principles (for both alternatives and cues)
2. Search-stopping principles (for both alternatives and cues)
3. Decision-making principles

--Identifying these as steps allows us to program a heuristic into a computer.

"These heuristic principles are the building blocks, or the ABCs, of fast and frugal heuristics." (17)

--Once we distinguish among these 3 parts, we see how new heuristics can be generated by recombining search-guiding principles with decision-making principles (i.e., the building blocks), etc.

--The positing of these steps (for computer modeling and theoretical understanding) may conflict with the conception of heuristics as non-algorithmic processes.

\*More on ecological rationality:

"To behave adaptively in the face of environmental challenges, organisms must be able to make inferences that are fast, frugal, and accurate. These real-world requirements lead to a new conception of what proper reasoning is: ecological rationality. Fast and frugal heuristics that are matched to particular environmental structures allow organisms to be ecologically rational. The study of ecological rationality thus involves analyzing the structure of environments, the structure of heuristics, and the match between them." (18)

\*One problem with many theoretical models: they overfit the data (e.g., the Weather Channel example). (19)

--One moral: more information does not necessarily lead to better decision-making.

\*Gigerenzer criticizes much work on rationality as focusing too much on *coherence criteria* (e.g., deductive logic and probability theory, or what we have called the Standard Picture of Rationality). He has Tversky and Kahneman's work in mind here:

"Instead of considering these issues of content and real-world adaptiveness, most experimental research programs aimed at demonstrating the rationality or (usually) irrationality of humans and animals have used the abstract coherence criteria." (21)

--Gigerenzer endorses *correspondence criteria*, “measures that relate decision-making strategies to the external world rather than to internal consistency”. (22)

\*Gigerenzer’s research group uses the term ‘heuristic’ to refer to a cognitive process that applies to situations in which using formal logic and probability theory are inappropriate. This sharply contrasts with Tversky and Kahneman’s usage. (25)

--“The heuristics-and-biases program suggests that ordinary people are cognitive misers who use little information and little cognition and thus are largely unable to estimate probabilities and risks.” (27)

“In our program, we see heuristics as the way the human mind can take advantage of the structure of information in the environment to arrive at reasonable decisions, and so we focus on the ways and settings in which simple heuristics lead to accurate and useful inferences. In contrast, the heuristics-and-biases approach views heuristics as unreliable aids that the limited human mind commonly relies upon despite their inferior decision-making performance, and hence researchers in this tradition seek out cases where heuristics can be blamed for poor reasoning.” (28)

--ABC claims 2 advantages over T&K:

1. Actual computational models of heuristics (greater precision).
2. Acceptance of the correspondence criteria for rationality.

--The spirit of T&K is that we would be better off not following their heuristics (if we could replace them with something more in accord with logic/probability), whereas the ABC group denies this. For the ABC group, heuristics should not be eliminated (even in principle).

\*The adaptive toolbox: “the collection of specialized cognitive mechanisms that evolution has built into the human mind for specific domains of inference and reasoning, including fast and frugal heuristics.” (30)