



Book Review

Decisions, Uncertainty, and the Brain: The Science of Neuroeconomics by Paul W. Glimcher. MIT Press, A Bradford Book, 2003.

Reviewed by Paul A. Wagner

Economics is often described as the queen of the social sciences. More specifically it is econometrics and its underlying theory that sets economics above much of the rest of the social sciences. Glimcher wants to bring the mathematical rigor of economic modeling as well as its underlying theory to the study of neurobiology.

The neurosciences have long been notorious for being data rich but theory poor. Glimcher sketches a way for developing the long sought after theoretical architecture. He of course is not the first to propose such a theory. There are so many being proposed in fact that the phrases “bottom – up” and “top – down” have become ubiquitous among neuroscientific thinkers. And of course, there are the ever-present recommendations for some sort of eclectic approach proposed by people such as Daniel Dennett and Paul and Patricia Churchland.

Glimcher’s project shares something in common with Patricia Churchland’s extraordinary best selling *Neurophilosophy*. Fans and critics of both books seem often to be one and the same persons. For example, neuroscientists loved the philosophy of science in Churchland

and her subsequent pointers for developing the much needed general theory of the mind/brain. The same people would also confess disappointment at the relatively elementary account of current neuroscience in her book. Similarly, her philosophical colleagues love the neuroscience but think she could do something more ambitious with the philosophical development of her foundational metaphysic. So virtually everyone who commented on Churchland seemingly championed the book but with fussy caveats reflective of the reviewer’s own expertise. I suppose that is the way things always are to some extent but Churchland’s book seems to be a victim of that more than most others. I sense Glimcher’s work will share in something of the same fate.

As a philosopher, I grew tired of what I took to be the tedious development of Cartesian themes. The neuroscience is good and, as always, likely to pique the sensibilities of philosophers and social scientists reading the book. The application of economic theory to neuroscience I expected to be predictable, but instead Glimcher’s thinking turned out to be highly imaginative. Econometricians may deny this

claim but I think only because the econometric sections develop no interesting mathematical manoeuvres of their own but are happy to apply what already exists and is commonly employed throughout the field. So, in the end, Glimcher may be subject to what can probably be called the “Churchland effect”. Readers will love the book for the subject matter sections for which each is least familiar. But there is something that sets Glimcher’s project apart other than the uniqueness of his spin on things.

Glimcher attacks his thesis by telling a story with many interesting vignettes along the way. Glimcher’s characters, David Marr, John Nash, Charles Sherrington, John Maynard Smith, and others loom large as real people tackling heroically complex problems against all odds and often without the support of fellow intellectuals. This makes Glimcher’s book a very good read and helps somewhat for more informed readers to be distracted by the Churchland effect.

Glimcher begins predictably enough with the Cartesian quest to give a deterministic account of human physiology. He proceeds with an adequate account of how others including Pavlov and most particularly Charles Sherrington pursued the quest for giving a fully deterministic account of each human action under study. Glimcher notes that such studies have proven in the past to be very revealing of how certain repetitious actions seem to be animated from an initial beginning point to a predicted conclusion. The problem as Glimcher sees it is that, each account is situated in a contrived problem space that neglects the organism as a whole and settles for plausible descriptions producing highly predictable results but only within a stiffly designed problem space unlike that characteristic of real animal action. Glimcher’s suspicion is that something more general is needed and so he unabashedly turns to hero worship of the top down models proffered by David Marr and his disciples in the early 1980s. Glimcher’s appreciation for Marr’s modeling exploits is so generous that one at first expects

Glimcher to be attempting a new top down approach in the spirit of Marr. However, despite Glimcher’s admiration for Marr, he is too clever to settle on a top down approach when everyone knows that there is an abundance of neurological data leading to the conclusion that much of what we do has in fact very modest origins in the neighborhood of a handful of agitated neurons. So, Glimcher sets out to produce a model that is responsive to independent bottom up fluctuations but is tempered by an overriding set of system goals of evolutionary origin.

If Darwin was stimulated in part by Thomas Malthus, Glimcher appears to be inspired by the spirit of economist David Ricardo. For Glimcher, evolution is not driven solely by a desire to replace generations of generally like copies of a given species. Rather for Glimcher, evolution also seems to recognize the importance of foraging and other competencies which are independent of the fitness criteria that rests on the production of numerous robust progeny as its sole criteria of success. For Glimcher, natural selection is as concerned with satisficing strategies as it is with mating and protection of the young. Ultimately all are fundamental to species’ survival as well as to determining the fitness of both emerging and deteriorating species. Glimcher initiates his economic tale by showing how prey theory in animal ecology studies has been so successful in predicting much animal behavior.

Prey theory echoes the classical model of economic man. In both prey theory and economic man models each actor is rationally self-interested in its own success. Consequently, in such models, behaviors can be accounted for simply by identifying the actors intended goals and then outlining a probabilistically, plausible account of how the animal’s actions utilize a cost-benefit approach satisficing a desired outcome. This is hardly a novel idea and given the criticism leveled at classical man models of economics over the last fifteen years it may even seem a less than fruitful avenue for Glim-

cher to pursue in his econometric approach to neuroscience. But here is where the charm of Glimcher's approach begins to emerge.

Prey models avoid postulating self-selected goals and accept only what is minimally necessary for any animal to evidence some evolutionary resiliency throughout its life. The goals any animal has are few and far between. They are simply those goals inheritance and the world have forced upon the animal if it is to secure another moment of promising vitality. A second advantage of prey models is they work very nicely to give an account of the very stupid. Such things as spiders, ants and who knows, maybe even fraternity men as well can have their comings and goings simply explained as a satisficing attempt to draw another few sparks of energy from the world around them. In any case, the dumbness of the actors in the model make it an attractive analogical model for what neurons might do to secure their longevity just one more moment.

Spiders and ants are hardly math giants or probabilistic wizards. (And, I fear much the same about most fraternity men but I will no longer belabor that point.) Yet they behave just as economic models of satisficing typically predict. They do in search for food, mating, securing a place for rest and so on. In short, economically modeling shows that very dumb creatures can do very savvy things without thinking things through as might a decision theorist but just as a result of millions of years of chance strategies that led to some species acquiring a good shot as staying around for at least one more generation – assuming the world stays largely as it is during that generation's existence.

The neurons of the brain too are each quite dumb. But centuries of evolution have led to

probabilistic responses to stimuli that together throughout the brain create strategies for keeping the entire system in tact for one more generation (again, assuming the surrounding world stays roughly as it is for the current generation.). For Glimcher, econometric models are as accurate as anything imaginable for showing that billions of dumb neurons can come to act in concert to increase the likelihood that the system, the animal, will spend its resources wisely to secure its place in the world a moment from now.

The cognitive psychologist seemed to have something like this in mind but his modular theory may have postulated more entities than is necessary - or so someone like Glimcher might claim. Glimcher's econometric models that model the system all at once as it were, bring Occam's razor to bear on models like Minsky's and other top down theorists and create a simpler way for conjuring up an approach to a grand theory of mind/brain. There is a great deal of novelty in this approach and it certainly makes reading Glimcher well worth the time. A caveat is worth noting however. While I am impressed with the heuristical value of Glimcher's approach I think it is too early to conclude that the ultimate mind/brain models will necessarily have a probabilistic foundation. On the other hand until much more research is done – decades more – Glimcher's approach will help explain much and illuminate anomalies inviting further research. What more does anyone have a right to ask from a theory?

Paul A. Wagner, Ph.D., Director, Project in Professional Ethics, Department of Philosophy, University of Houston – Clear Lake, Texas, USA. Email: wagner@cl.uh.edu.