

STATISTICS COLLOQUIUM

MONDAY, MARCH 26, 2012

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

“AN EVOLUTIONARY MODEL OF BOUNDED RATIONALITY AND INTELLIGENCE”

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ABSTRACT

In a simple evolutionary model with one-period agents that make binary choices which determine their reproductive success, we show that natural selection is capable of generating several behaviors that have been observed in organisms ranging from ants to human subjects, including risk-sensitive foraging, risk aversion, loss aversion, probability matching, randomization, and diversification. Given an initial population of individuals, each assigned a purely arbitrary behavior with respect to a binary choice problem, and assuming that offspring behave identically to their parents, only those behaviors linked to reproductive success will survive, and less reproductively successful behaviors will disappear at exponential rates. When the uncertainty in reproductive success is systematic, natural selection yields behaviors that may be individually sub-optimal but are optimal from the population perspective; when reproductive uncertainty is idiosyncratic, the individual and population perspectives coincide. The simplicity and generality of our model imply that these derived behaviors are primitive and universal within and across species. This framework also suggests a natural definition of intelligence---any behavior positively correlated with reproductive success---and links physiological and environmental constraints to the degree of intelligence that emerges, i.e., bounded rationality.

Andrew W. Lo (joint work with Thomas J. Brennan).