Lars-Erik Cederman, Emergent Actors in World Politics (Princeton: Princeton University Press, 1997), Chapter 3 (pp. 37-71).

Towards Richer Models

I. Cederman first elaborates on the problem of historical contingency, arguing that most social scientist fail to distinguish between simple and complex systems. In the presence of nonlinearity initial conditions and complex interaction of independent variables will have dramatic effects on the outcome of events. Any counterfactual will thereby cease to be cotenable (i.e., "connecting principles, including empirical and theoretical mechanism . . . [must] be consistent with the counterfactual scenario" (p. 41)). Cederman argues that any explanation of long-term change "must make the historical paths of the counterfactual scenarios explicit" (p. 43).

II. Current rationalist theories suffer from biases due to methodological individualism (i.e., "the doctrine that all social phenomena -- their structure and their change are in principle explicable in ways that only involve individuals," quoting Elster (p. 44-45)) and materialism. They cannot account for intersubjective collective identities (also described as "figurations" or "objective content of thought" (p. 47)) that are not clearly in the positive or normative realm.

III. To address these problems, Cederman introduces the Complex Adaptive Systems ("CAS") approach. A CAS is defined as "an adaptive network exhibiting aggregate properties that emerge from the local interaction among many agents mutually constituting their own environment" (italics omitted, p. 50). A CAS is characterized by emergent properties, local interaction, a large number of agents, and adaptive nature of agents. The CAS method differs from conventional modeling techniques by its reliance on induction and emphasis on synthesis and engineering (in lieu of reduction).

IV. The CAS approach enables researchers to (a) model historical contingencies by performing "systematic and controlled [complex] thought experiments" (p. 54), and (b) model collective identities by employing an identity and culture schemata.

V. Cederman responds to objections to CAS Modeling:
   a. Ad hoc assumptions: All rationalist models fall prey to these charges, but Cederman attempts to minimize these objections by relying on substantive theory and building the models up step by step.
   b. Failure to yield unique predictions (nonfalsifiability): Multiple equilibria are inevitable consequences of path dependence and the simulations serve a heuristic rather than a predictive purpose.
   c. Fragility of results (contingency on parameter specification): Cederman considers this the most serious charge, and responds that the mere fact that certain phenomena are not "amenable to elegant theoretical formalization" is not reason to reject a method of gaining understanding of the world (p. 64).

d. Lack of cumulation (difficulty of replication): Cumulation is not a reason to reject the CAS methodology and greater efforts to interpret and convey CAS results will minimize this weakness.

CAS may be characterized as a form of "process-tracing" that defies context-free testing and may lead to a more dynamic understanding of phenomena (potentially falling in line with more constructivist and critical interpretation of IR). Cederman lastly provides a very brief overview of the four models discussed in the book (see fig. 3.4 & table 3.1, pp. 69-70).