Robert Jervis, *System Effects: Complexity in Political and Social Life* (Princeton: Princeton University Press, 1997), Ch. 2 (pp. 29-91)

We cannot understand systems by examining the interconnected elements alone.

Key points:
1. Many crucial effects are delayed and indirect
2. Relations between 2 actors are often determined by each actors relations with others
3. Interactions are central and cannot be understood by additive operations
4. Many outcomes are unintended
5. Regulation is difficult
6. Methods used by actors and social scientists are not appropriate to systems

Indirect and delayed effects
- Indirect effects are often more important than direct effects
- One must consider time horizons:
    o Many effects are delayed
    o Delays make causal relationships difficult to determine

Relations often not bilaterally determined:
- Policies towards one state will have implications for/effects other states

Interactions are not additive:
- Linearity cannot comprehend most actions. In systems, many variable have non-linear functions (eg, laws of diminishing returns, critical thresholds, etc.) Direction may be reversed as stimulation is increased (eg, war is less likely when power is highly concentrated or highly dispersed, more likely at intermediate levels)
- The effect of one variable may depend on which others are present
- 2nd best conditions do not necessarily lead to 2nd best outcomes
- Timing is crucial. The ordering of events is a key determinant of outcomes as events shape the environment in which future events occur. (A factor that is the cause of important effects can cause changes in the environment such that the effects continue after the factor is removed)
THEREFORE: the status of a system depends not only on the state of particular variables, but on how that state was reached. If one finds that changing a variable does not change the outcome, the implication is not necessarily that the variable is unimportant; it may be that change requires 2+ variable to be altered.

- Results cannot be predicted from separate actions
    o The effect of one variable may depend on the state of another (eg, mixing two medicines together produces harmful effects; either medicine alone is beneficial)
    o One cannot simply add the effects of a system together
    o Complex systems often fail b/c several components fail; any singular component failure may have been harmless
    o Examples: Traits that ensure survival in one context are useless in another; the key piece of the puzzle is only key because of the others that are in place; the presence of the bad cop allows the good cop to be effective

- Strategies depend on strategies of others

- o Strategies often depend on the anticipated reactions of others
- o Our judgment of the wisdom of policies of one actors implies judgment of other actors' policies
- o Errors are likely to be interrelated (our judgments can be correct, but the other actor's judgment was not, therefore our original judgment is incorrect – for instance, Pearl Harbor)
- o The interaction of strategy helps explain the fact that behavior that seems harmful often works to one's advantage (flushing money into the apparently worthless SDI initiative convinces the Soviets that we have money to burn and causes them to throw in the towel)

- Behavior changes the environment
  - o Initial behaviors and outcomes influence later ones, producing over-time dynamics that cannot be characterized as cause and effect
  - o What each actor does affects how others react, as well as the number/type of others with which the actor deals, which in turn affects the actors behavior
  - o Actions can produce deeper changes in values. People change as the are affected by experiences, including those that they have chosen (even though individual states might ignore int'l institutions if "push came to shove", international institutions help ensure that push doesn't come to shove)
  - o Notion of ceteris paribus often does not exist
  - o Feedback loops render the language of "dependent" and "independent" variables meaningless
  - o As do circular effects (security dilemma)

Outcomes do not follow from intentions
- One cannot infer results from preferences, and vice versa
- The law of unintended consequences holds true (aid programs that wind up feeding armies and fueling conflict)
- Incentives cannot necessarily ameliorate the problems of unintended consequences (Soviet planning: orders to maximize production while minimizing waste produced huge quantities of shirts – in XXL only)
- (Nonetheless, one shouldn't diminish the role & success of concerted action)

Regulation
- Again, one must remember the laws of unintended consequences (Titanic effect: a greater margin of perceived safety increases risk-taking behavior. Circular staircases prove safer than regular staircases because people perceive them to be dangerous and take greater care)
- Again, no ceteris paribus. In reality of system, one cannot ever hold all other things constant
- Regulation will alter incentives and opportunities of actors and produce multiple consequences. Some consequences will be unanticipated

Implications for testing and method:
- Systems provide a real challenge to conventional methods. It is difficult to test propositions when one cannot hold things constant. Systems complicate the concepts of cause and effect, as variables are interconnected. The value of yardsticks/benchmarks are diminished as the presence of the yardstick or benchmark changes behavior.

Conclusions:

1. Additive and linear operations are not accurate because the impact of one variable or strategy depends on another, as actors shape and are shaped by their environment

2. Systems are highly complex. Results are often unintended. Regulation often misfires. Actors react in unanticipated ways.

3. Systems pose huge methodological problems, complicating concepts of power and causation, preventing the use of standard tests and undermining yardsticks/indicators of success.