

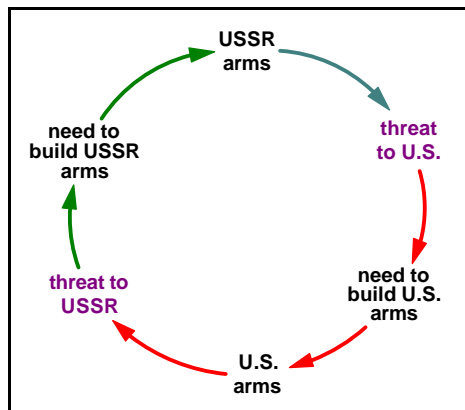
**Class 4, 4/28/04**

Attendance		20
Discussion on Coming Class Presentations		
5D Chapters 5	LCD projection & discussion	40
Break		10
Review Assignment (5D Ch 5 diagrams)		20
Counterintuitive Behavior of Social Systems	Discussion	20
Break		10
Counterintuitive Behavior of Social Systems	Discussion	20
Reflection Paper Review, General discussion		30
		170

**5D. Chapter 5: A Shift of Mind**

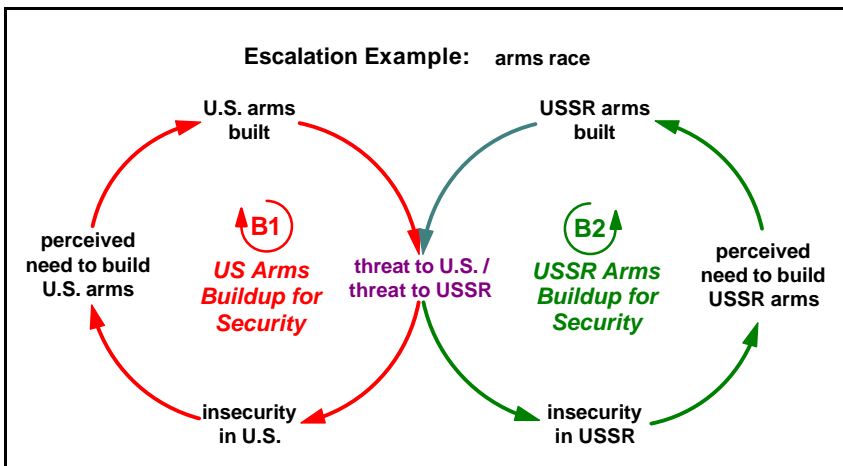
**SEEING THE WORLD ANEW**

- “whole” & “health” come from the same root  
 “So it should come as no surprise that the unhealthiness of our world today is in direct proportion to our inability to see it as a whole.”
- Threads of tools and techniques of systems thinking
  - ♦ “feedback” concepts of cybernetics
  - ♦ “servo-mechanism” engineering theory
- The “arms race” ... a dynamically complex problem



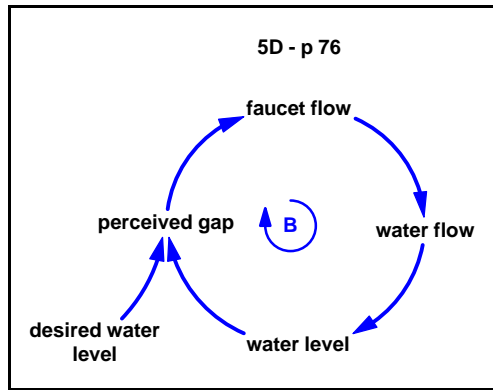
- “Doing the obvious thing does not produce the obvious, desired outcome.”
- “The real leverage in most management situations lies in understanding dynamic complexity, not detail complexity.”
- Dynamic problem examples
  - ♦ developing profitable mix of price, product/service quality, design, availability for a strong market position
  - ♦ improving quality
  - ♦ lowering total costs
  - ♦ satisfying customers in a sustainable manner
- “Most “system analyses” focus on detail complexity not dynamic complexity.”
- How does one escape from an arms race dynamic?

- Requires seeing:
  - ♦ interrelationships between actions and seeing threats created
  - ♦ delays between an action and its consequence
  - ♦ seeing patterns, not just events



- Influence is reciprocal. “... every influence is both *cause* and *effect*.”

## SEEING CIRCLES OF CAUSALITY



patterns (as many environmentalists fear occurs with such pollutants as CFAs). By the time the problem is noticed, it may be too late. Extinctions of species often follow patterns of slow, gradually accelerating decline over long time periods, then rapid demise. So do extinctions of corporations.” !!!

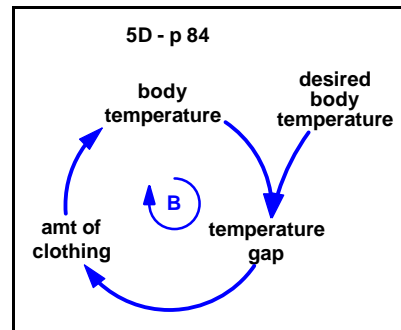
### ♦ Balancing

- steering a car
- staying upright on a bicycle
- homeostasis
- 
- 

- *From the systems perspective, the human actor is part of the feedback process, not standing apart from it. This represents a profound shift in awareness.”*

“... the system has its own agenda.”

- “The feedback perspective suggests that *everyone shares responsibility for problems generated by a system. That doesn’t necessarily imply that everyone involved can exert equal leverage in changing the system.* but it does imply that the search for scapegoats — a particularly alluring pastime in individualistic cultures such as ours in the U.S. — is a blind alley.”

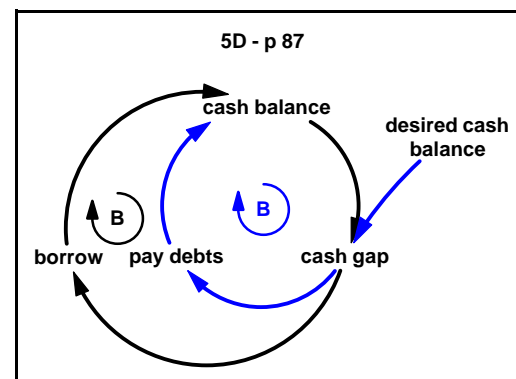
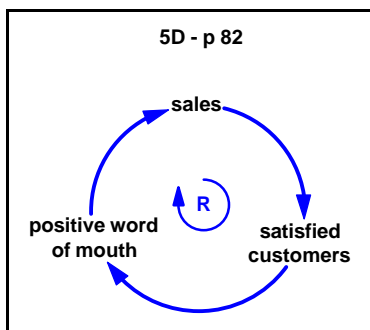
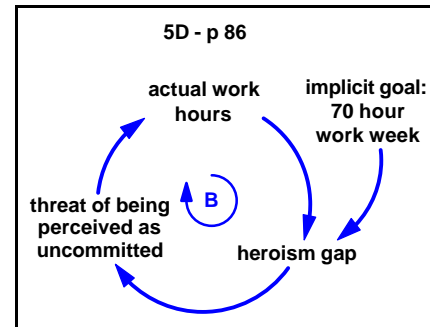


- Our language is limited ... we need a feedback language.

### • Types of feedback loops

#### ♦ Reinforcing (virtuous or vicious)

- “self-fulfilling prophecy”
- “Pygmalion effect”
- “gas crisis”
- “run on a bank”
- “word of mouth” sales
- 



- Pond with lily pads

“That’s why environmental dangers are so worrisome, especially those that follow reinforcing

**Question: In long-lived systems, are there more reinforcing or balancing processes?**

Why is there resistance to change?

Compensating feedback

Policy resistance

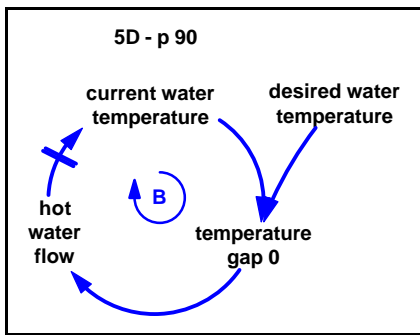
**DELAYS**

Ray Stata: "One of the highest leverage points for improving system performance is the minimization of system delays."

George Stalk: "The way leading companies manage time ... represents the most powerful source of competitive disadvantage."

Unrecognized delays can lead to

\_\_\_\_\_ and \_\_\_\_\_ (p. 89)



Systems thinking is generally oriented toward the long-term view. That's why delays and feedback loops are so important. In the short term, you can often ignore them' they're inconsequential. They only come back to haunt you in the long term."

**Counterintuitive Behavior of Social Systems**

**Computer Models and Social Systems**

- "Social systems are far more complex and harder to understand than technological systems."

- "The mental images in one's head about one's surroundings are models."
- "Fundamental assumptions differ but are never brought into the open. Goals are different but left unstated."
- "... system dynamics simulation models are explicit about assumptions and how they interrelate."
- "The problem is not shortage of data but rather inability to perceive the consequences of information we already possess."

**Counterintuitive nature of Social Systems**

- "In many instances it emerges that the known policies describe a system which actually causes the observed troubles. In other words, the known and intended practices of the organization are sufficient to create the difficulties being experienced."

**Dynamics of Urban Systems**

- For modeling exercise can choose the description of our urban problems in the paragraphs on p. 8 beginning with this sentence:

"The investigation showed how depressed areas in cities arise from excess low-income housing rather than from a commonly presumed housing shortage. ... "Show how policies on p. 10 influence the structure.

**An important truth:**

"Programs aimed at improving a city can succeed only if they result in eventually raising the average quality of life for the country as a whole."

**On Raising the Quality of Life**

- "To raise one component of quality of life without intentionally creating compensating counter pressures to prevent a rise in population will be self-defeating."

**Characteristics of Social Systems**

- "First, social systems are inherently insensitive to most policy changes that people choose in an effort to alter the behavior of systems."
- "Human intuition develops from exposure to simple systems."
- "Second, social systems seem to have a few sensitive influence points through which

**behavior can be changed.** These high-influence points are not where most people expect. Furthermore, **when a high-influence policy is identified, the chances are great that a person guided by intuition and judgment will alter the system in the wrong direction.**"

- "System dynamics models suggest sensitive control points for increasing the world-wide quality of life exist in the rate of generation of capital investment and in food production, but that expansion of industrialization and food output are the counter productive directions, both should be restrained."
- "Third, social systems exhibit a **conflict between short-term and long-term** consequences of a policy change.
- **A policy that produces improvement in the short run is usually one that degrades a system in the long run.** Likewise, policies that produce long-run improvement may initially depress behavior of a system.
- This is especially treacherous. The short run is more visible and more compelling. Short-run pressures speak loudly for immediate attention. However, sequences of actions all aimed at short-run improvement can eventually burden a system with long-run depressants so severe that even heroic short-run measures no longer suffice.
- **"Many problems being faced today are the cumulative result of short-run measures taken in prior decades."**

#### A global perspective

- **That current growth rates of population and industrialization will stop is inevitable.**
- Unless we choose favorable processes to limit growth, the social and environmental systems by their internal processes will choose for us. The natural mechanisms for terminating exponential growth appear the least desirable.
- **Unless the world understands and begins to act soon, civilization will be overwhelmed by forces we have created but can no longer control.**

#### Attractive Policies Can Create Disasters

- Figure 3 shows how a technological success (reducing our dependence on natural resources) can merely save us from one fate only to fall victim to something worse (a pollution catastrophe).

Throughout the world an undercurrent of doubt is developing about technology as a savior from social and environmental ills. There is a basis for such doubt. The source of doubt lies not in technology itself but in management of the entire technological-human-political-economic-natural complex.

- Figure 4 should make us cautious about rushing into programs on the basis of short-term humanitarian impulses. The eventual result can be antihumanitarian. Emotionally inspired efforts often fall into one of three traps set for us by the nature of social systems:
  - (1) The programs are apt to address symptoms rather than causes and attempt to operate through points in the system that have little leverage for change;
  - (2) the characteristic of systems whereby a policy change has the opposite effect in the short run from the effect in the long run can eventually cause deepening difficulties after a sequence of short-term actions; and
  - (3) the effect of a program can be along an entirely different direction than was originally expected, so that suppressing one symptom only causes trouble to burst forth at another point.

#### An Alternative to Catastrophe

- **"There are no utopias in social systems." !!!**
- "There appear to be no sustainable modes of behavior that are free of pressures and stresses."
- "The more promising modes may require a degree of restraint and dedication to a long-range future that people are not capable of sustaining."
- "... reduction in investment rate and reduction in emphasis on agriculture are counterintuitive and not likely to be accepted without extensive system studies and years of argument — perhaps more years than are available."

#### The Nation's Alternatives

- Be sure and read first full paragraph on p. 27 beginning with "Population grows ..."  
Please, read it again.