"Science and Complexity"

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WEAVER, W. [1948]. "SCIENCE AND COMPLEXITY". AMERICAN SCIENTIST, 36(4): 536-44.

Major Themes

1. How have scientists historically addresses problems?
2. How can problems of "organized complexity" be studied and solved?

Types of Science

PHYSICAL SCIENCES

Few moving variables.

"Problems of simplicity."

Ahead.

LIFE SCIENCES

Many moving variables.

Stuck in the observation/recording state.

Behind.

Types of Problems

Simple Problems

- Small number of variables, "easily" solved

Complex Organized

- Medium number of variables

Complex Disorganized

- Lots of variables and lots of actors

Simple Problems

Few variables? Few moving pieces?

Relatively easy to solve on a case-by-case basis using our knowledge and skills.

What is Larry going to order for Lunch?

What angle do we need to hit this pool ball at to get it to a pocker?

Complex Disorganized Problems

Lots of variables and lots of moving pieces.

We can solve these problems using **statistics and probability**, because we are less concerned with single entities and more concerned with the whole.

How many of dish XXX will the restaurant sell in a given day?

How many times will a pool ball hit another pool ball in one minute, with 500 pool balls on a table?

Complex Organized Problems

Medium number of variables.

Still concerned with individual actors, so this can be a challenging endeavor.

What will each of the people in your five-person group order at the restaurant?

After a pool break, where will each of the 15 balls end up?

These are the problems that we need to get better at solving.

Complex Organized Challenges

"Problems of organized complexity."

All individual pieces are "interrelated to the organic whole."

What variables contribute to rush-hour traffic?

- Individual company EOD
- Closed ramps or exits
- Construction
- Crashes
- Carpooling Popularity
- Big events in town?

What can help solve these problems?

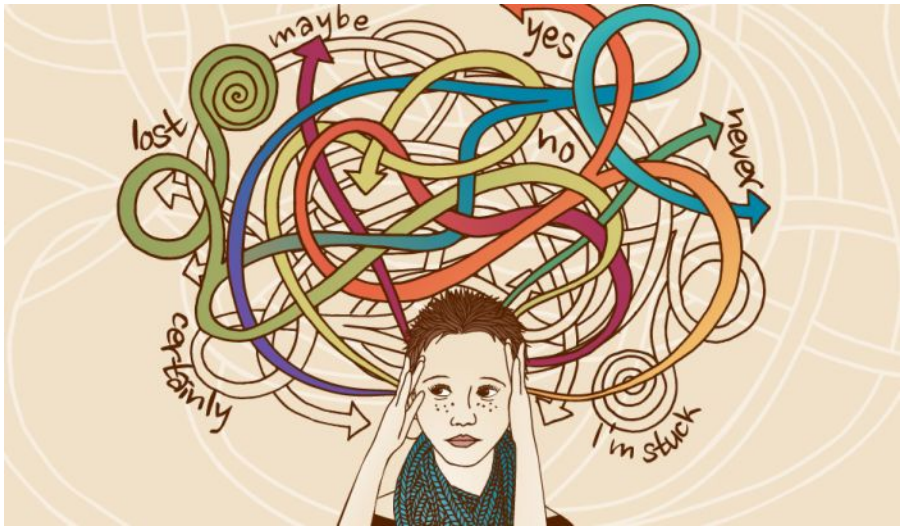
Solving Complex Organized Problems

Computers

- Crunching numbers faster.
- Programmed more like a brain.

Operations Analysis

- "mixed-teams"
- Interdisciplinary
- Eliminate domain silos



Science, with these new tools, can begin to solve these problems.

Questions

1. Has science begun to solve these problems of organized complexity?
   - If so, using computers and mixed-teams?
   - If not, what is stopping us?
2. This article was written ~1950. Is it still relevant?
3. Informatics is multi-disciplinary by its nature. Does this article lay out a case for Informatics?