

# Design and Research



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# Our Topics

- Nature of design
- Character of research
- ~~- The expression of quantum  
superposition in deductive systems for  
second-order logics~~

# **The Science of Design**

Herbert A. Simon

# Formalization of Design

# Artificial and Natural Science

# Recontextualization of Design as First-Order Logic

Tautological Truth, (Un)Satisfiable Truth



Turns out this paper was designed for  
me!



**Maxwell Bland**

April 13 at 1:05 PM · 🌐 ▼



The set of tautologies has a polybounded proof system iff  $NP=co-NP$ , but this seems not to be the case due to the nature of search. I am okay with the world in which  $P \neq NP$ , since the search for truth would be earnest, but it would be unfortunate if the universe has placed us into the realm in which the validation of truth was exponential in form. If there is a god, they do not wish their nature to be understood by the mind alone without luck and require, perhaps, a leveraging of quantum phenomena to approach an ability to accept their work.

<https://www.cs.rice.edu/~vardi/comp409/lec13.pdf>

Fixing some set of axioms is, of course, a separate problem, and I wouldn't classify this as unwavering truth, as Gödel so aptly described.

It follows from this general perspective that I feel the entire deconstructionist school is myopic in principle, approaching a solution to  $P=NP$  rather than  $NP=coNP$ , following from their failure to realize what Wittgenstein was really implying: notably the importance of tautologies over axiomatic systems. Derrida's *différance* brings attention to the nature of satisfaction of various synthetic propositions under different axiomatic systems but fails to address the deductive system in the abstract (as far as I have seen in his writing) which is, I would argue, far more important. My feeling, maybe incorrect, is that a couple decades to a century will reveal the current philosophical trends only carved out one half of the puzzle, and that complexity theorists were closest to understanding epistemological fact, though we will see what structure the proof of  $P, NP$  or  $coNP, NP$  take.





**Nancy Loewenberg** Wow Max this Grandma cannot understand any of this it's too deep for my old old mind, love you very very very much

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1

Command variables

Fixed parameters

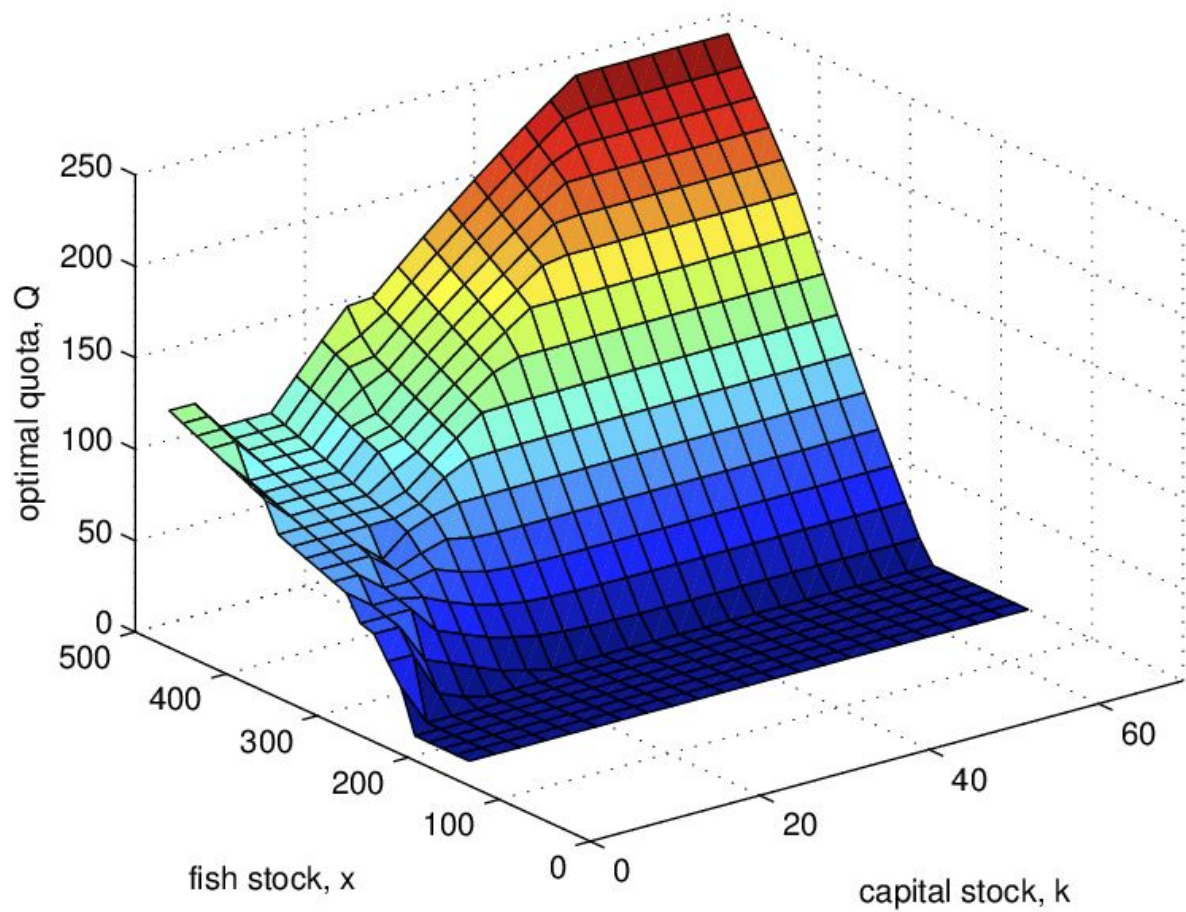
Constraints

Utility Function

Problem

# The External World

# Design as a Search Problem



# Achieving Satisfiability



# Path Finding

# Design as Iteration

# Design as Resource Allocation

Style is the Path Taken

# Design as Representation

# Some Interesting Points

An example of a problem that would be better optimizing for is to design an airplane that can physically function as it is supposed to.

Another interesting point this paper makes is that the search time of a real-world design problem is not dependent on the actual size of the search space.



**Let's Discuss**

Can you design for the weather?

The process proposed seems mechanical. What aspect of design is human?

# Pasteur's Quadrant

D.E. Stokes

What is research?

Applied and Basic

Pasteur's drive towards  
**understanding**

Pasteur's drive towards  
**control**



pure basic  
research

pure applied  
research

# False Dichotomy



## Considerations of Use?

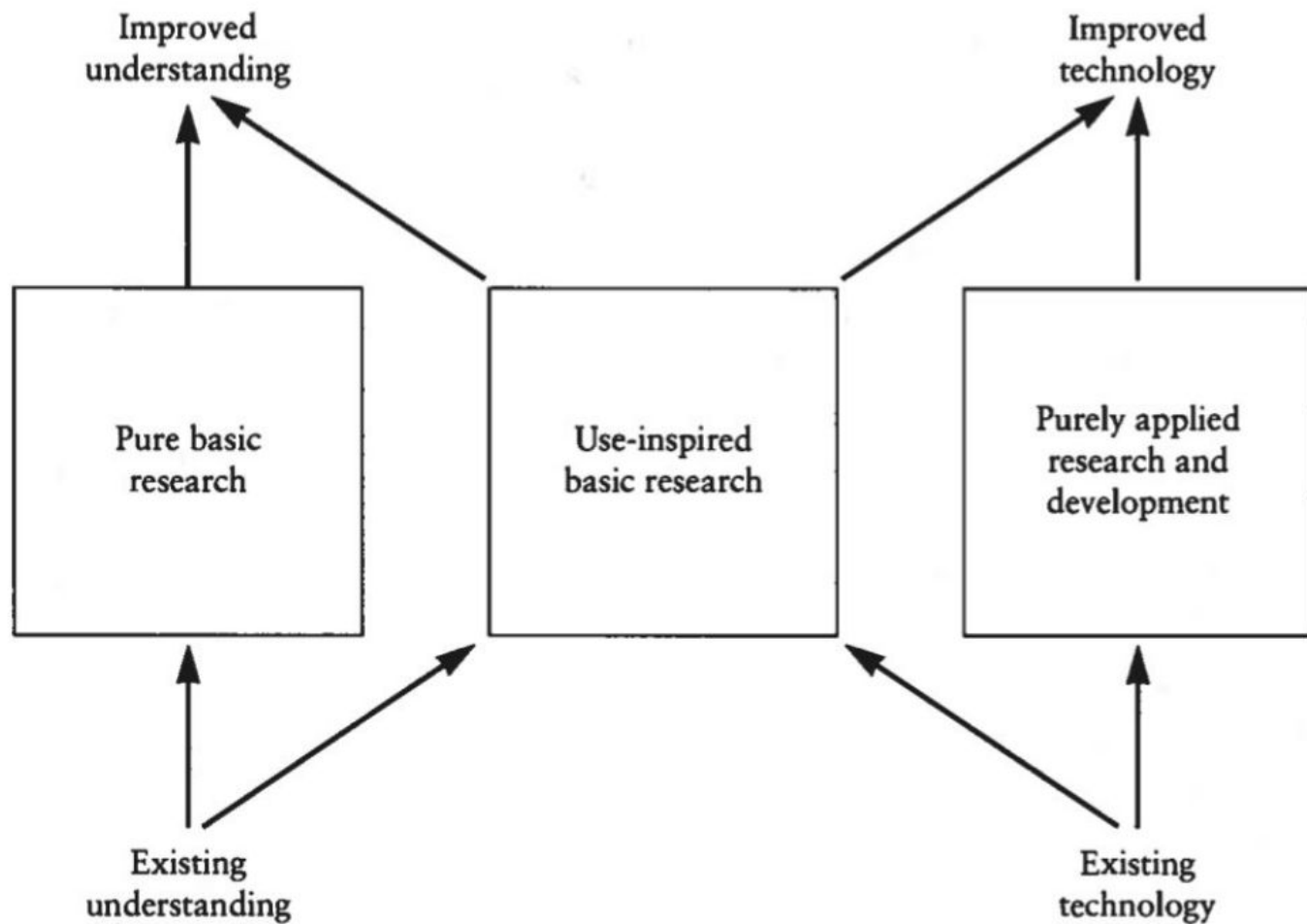
		No	Yes
Yes	Pure basic research	Use-inspired basic research	
No		Pure applied research	

**Quest for fundamental understanding?**

Pure Basic Research

# Use-Inspired Research

Purely Applied Research



# Some Interesting Points

I don't quite like the quadrant that leaves one "empty" because I believe all the quadrants encompass Wissenschaft.

One thing I wish the paper did better was  
expand more on the practical  
implications of categorizing research  
differently.



And now for some loaded questions

In what circumstances and how would you apply Stoke's model to research? How does the use of this model differ from Simon's?

Is there a project in the world that the  
Stoke's model does not describe?