

ADVANCED DESIGNS HOW SCIENCE EVOLVES

Start with the basics
and then keep going

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ADVANCED DESIGNS EVOLVE KNOWLEDGE

Be critical
be engaged

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ADVANCED DESIGNS?

Path of scientific progress

Neither too simple nor too complex

Not only deductive

Evolve over longer time spans

Take experience to learn

Scientific designs can be defined as pathways towards knowledge approximation.



ADVANCED DESIGNS AS PARADIGM SHIFTS - EXAMPLES

Interviews

Statistics

Social surveys

Case databases

Remote sensing

Animal telemetry

Machine learning

Participatory workshops

etc.



EXAMPLE 1: STATISTICAL DESIGNS

Began with the ANOVA

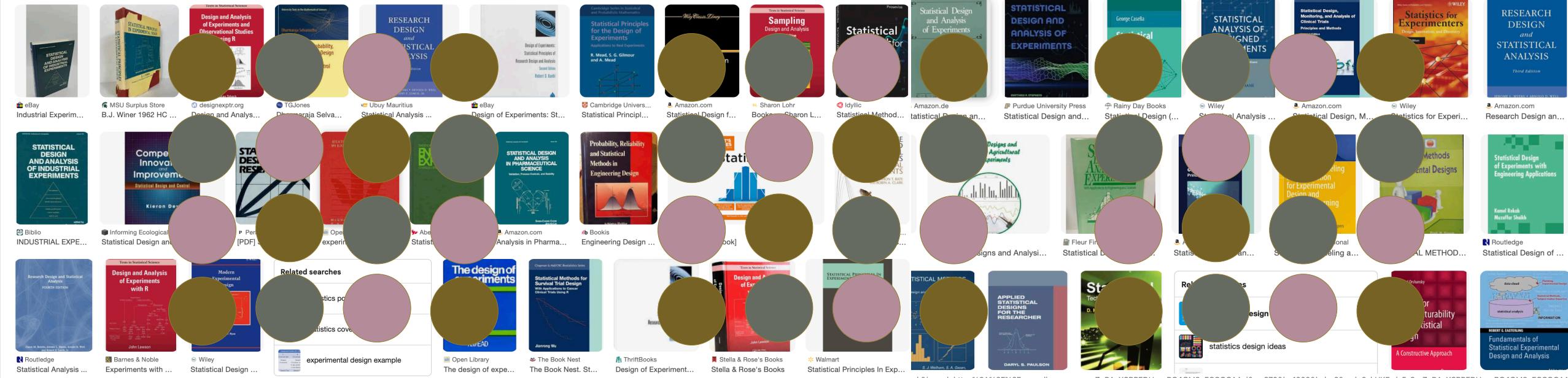
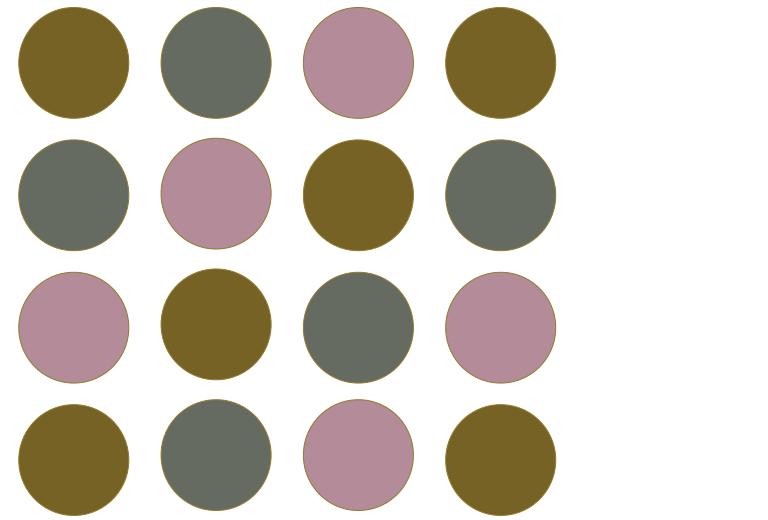
Allowed for field experiments

Tamed variance of sampling units

Accelerated by computers & software

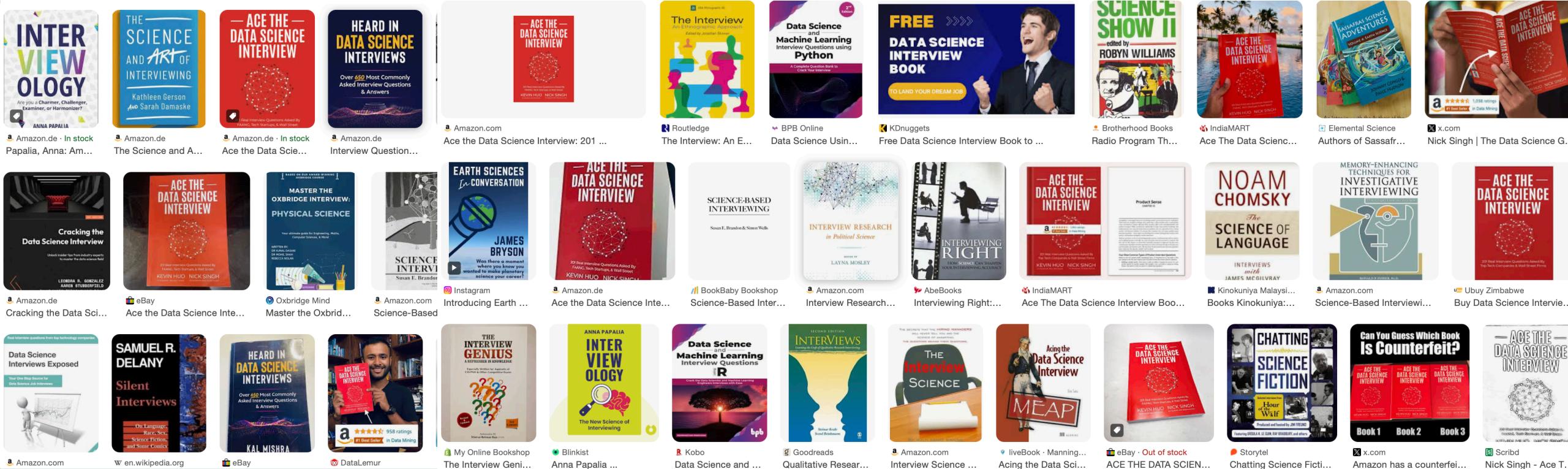
Second wave through mixed effect models

Increasingly diversified in recent years



EXAMPLE 2: INTERVIEWS

Slowly evolving initially
Spread into diverse disciplines
Recording devices made a difference
Different dogmas reflect inductive vs deductive gradient
Novel analysis pathways through technology
Diversification of settings & contexts



PARSIMONY OF DESIGNS

As simple as possible and as complex as necessary

Wild topic - tamed method, Tamed topic - wild method.

Always consider the diversity of information - AI is the worst

Replicates confirm information

Start with a textbook

Find papers to build momentum



VECTORS OF INNOVATION IN ADVANCED DESIGN

Trivialisation of knowledge as a starting point

Generational shift or rift

Often scales place based

Technic serves, but does not always drive innovation

Competition vs collaboration

Students with stamina



METHODS VS. THEORIES

No more than 1-2 theories (please)

Inductive research uses theories as guardrails

Deductive theories keep re-calibrating

Theories are hard to abandon

Theories keep returning

Theories are lenses



METHODS VS. THEORIES - EXAMPLES

Ecosystem services

Competencies in education

Stakeholder theory

Theory of planned behaviour

Investigating science itself



METHODS VS. THEORIES - MIND THE BIAS

Endless confirmations

Restricted perspectives through rigid designs

Lack of limitations

Standard biases = easy way out

Buzzwords propel biases



METHODS VS. THEORIES VS TOPICS

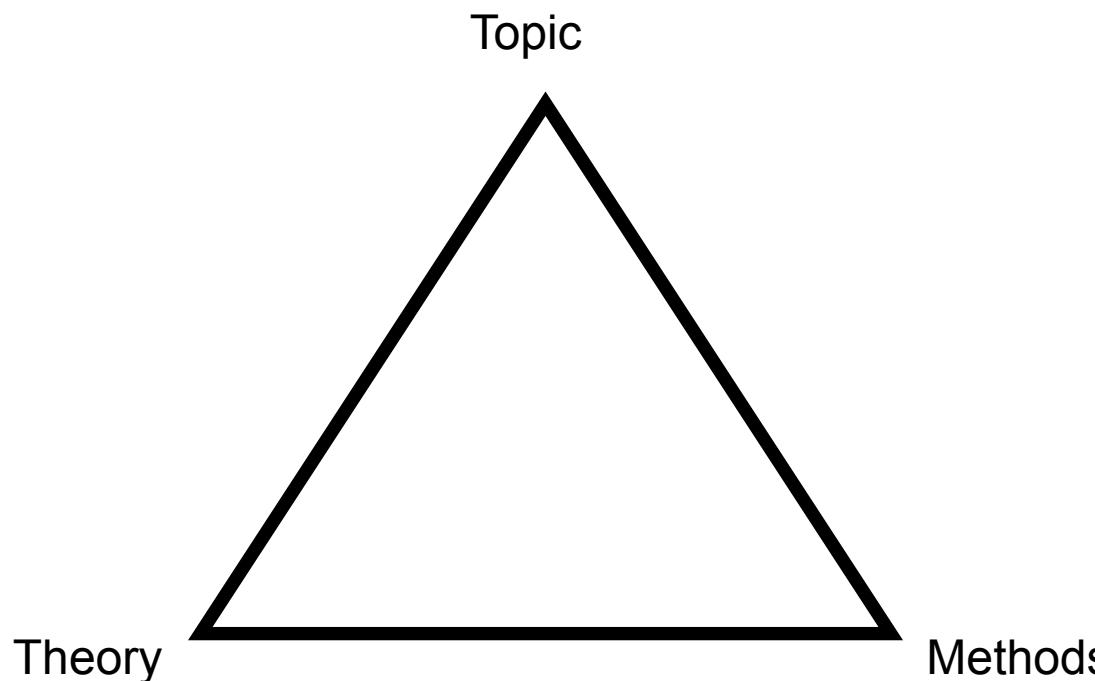
Innovation more likely on 1-2 than all three

Biggest innovation may strike all three

Single research moves much smaller

Community momentum

Serendipity



ADVANCED DESIGNS - A TIMELINE

Fast innovation is rare

May operate in 1-2 generational waves

Get buried with textbooks

Can be learned by students before

May change under current acceleration



ADVANCED DESIGNS - A STARTING POINT

Lectures are where it begins

1000 hours++

Papers & applications

Beginning to end

Mentoring

Supervision



ADVANCED DESIGNS - BEST OF...

Jennifer Doudna

Elinor Ostrom

Roy Bhaskar

Ben Bolker

Jari Oksanen

Maria E. Fernandez-Gimenez



ADVANCED DESIGN - EXAMPLE 1

	Quantitative		Qualitative	
	Inductive	Deductive	Inductive	Deductive
System thinking				
Strategic				
Anticipatory				
Normative				
Interpersonal				Wiek et al 2011 Sust Sci

ADVANCED DESIGN - EXAMPLE 2

	Quantitative		Qualitative	
	Inductive	Deductive	Inductive	Deductive
Information				
Consultation				
Collaboration				
Empowerment				Brandt et al 2013 Ecol Econ

SUMMARY

- Advanced designs are parsimounious evolvements of science
- These approaches evolve and get ideally critiqued
- Innovation in methods interacts with theories and topics
- Novel designs create new branches of science
- Learning advanced designs takes time



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