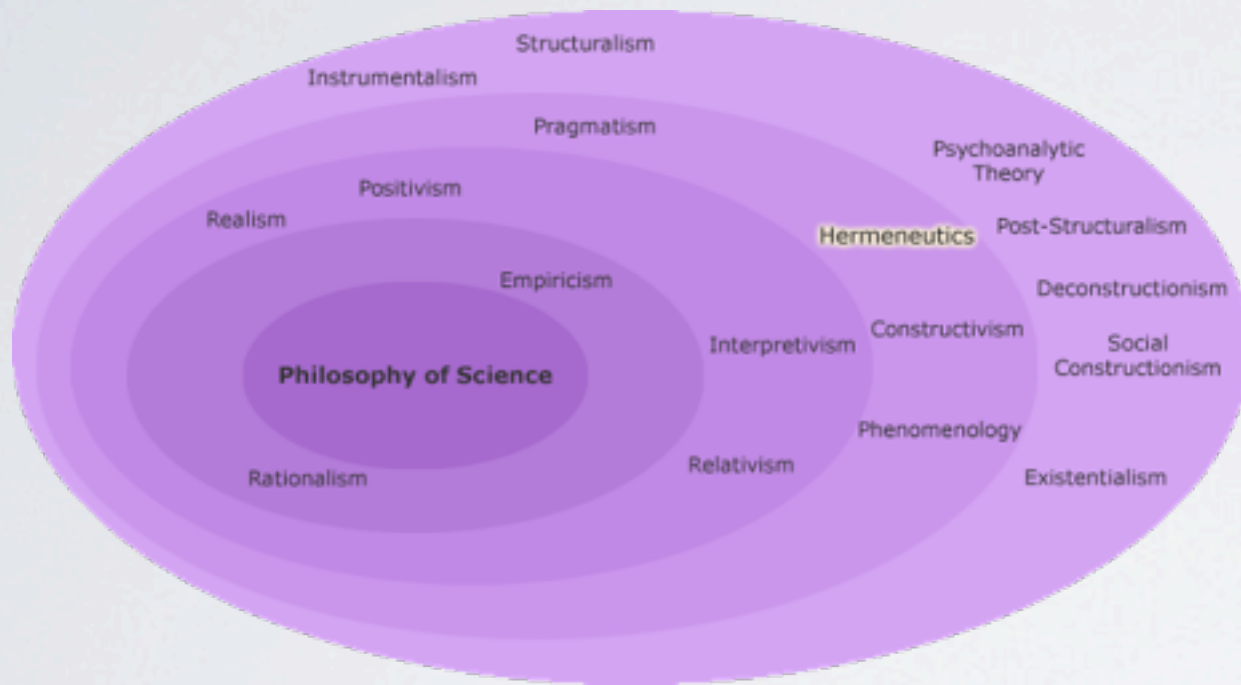


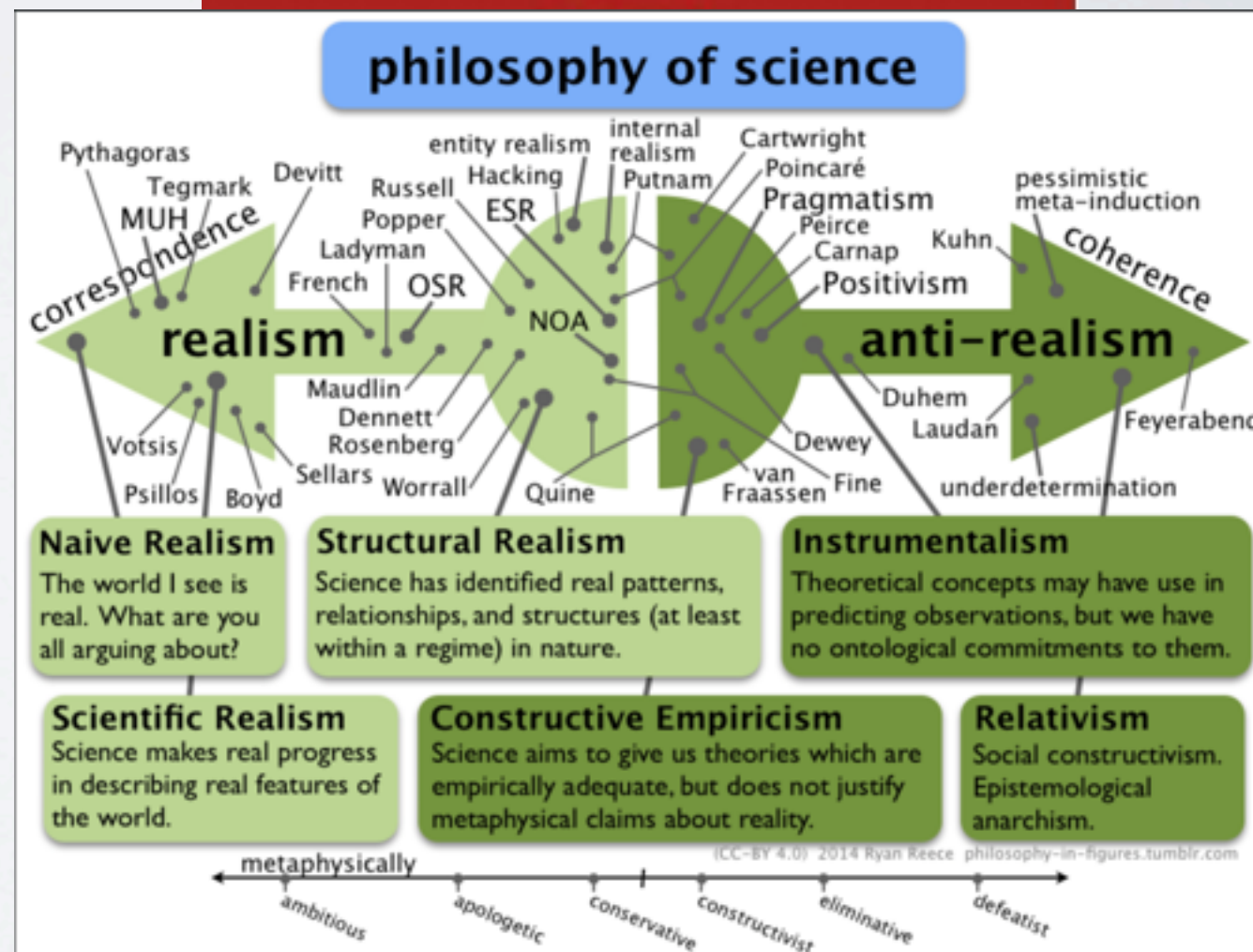
# SCWK 7411 - PHILOSOPHY OF SCIENCE AND RESEARCH



Spring 2017  
Ross A. Klein, PhD  
Catherine de Boer, PhD

"PHILOSOPHY OF SCIENCE WITHOUT HISTORY  
OF SCIENCE IS EMPTY; HISTORY OF SCIENCE  
WITHOUT PHILOSOPHY OF SCIENCE IS BLIND."

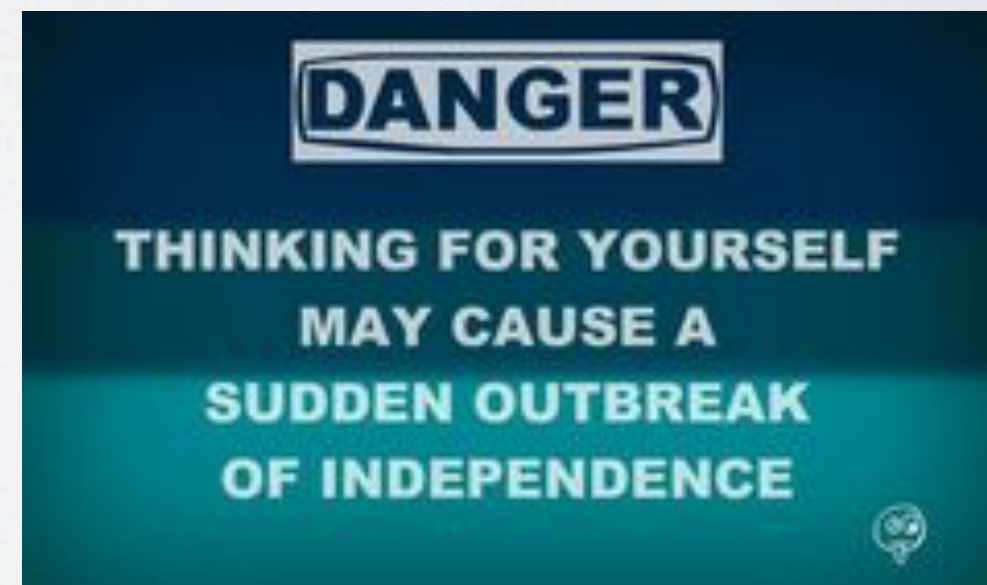
IMRE LAKATOS





# INTRODUCTION TO COURSE

- Purpose
- Content
- Texts and use of journals
- Assignments
  - Presentations/papers & Final paper
- Selected reading list and resources
- Format and structure of class sessions
- Comments about taking notes



Scottish Independence



# HUMAN INQUIRY & SCIENCE

- Human Inquiry: How do we know what we know?
  - Direct observation
  - Content analysis
  - Social interactions
- The result: problem of relativity - each person's experience and construction of reality is different

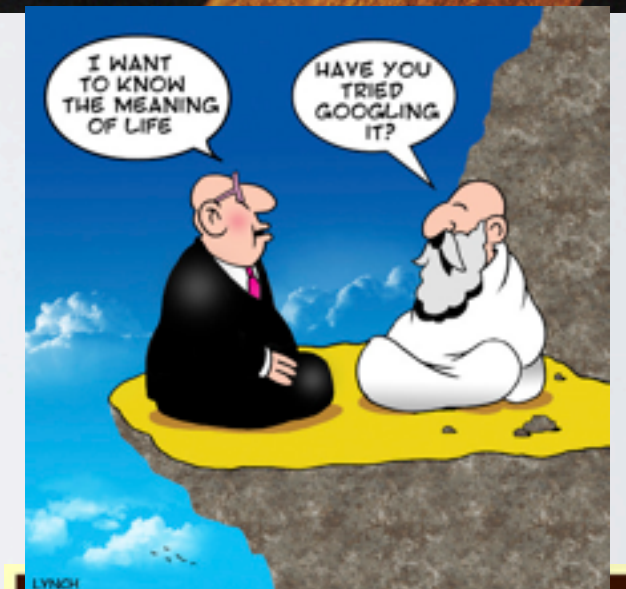


**YOUR CHILD WILL  
FOLLOW YOUR  
EXAMPLE, NOT  
YOUR ADVICE.**



# SOCIAL CONSTRUCTION OF REALITY

- Socio-historical-cultural time and space (location; biography/autobiography/"accounts")
- Ideas and knowledge are situated in time and space
- Problem of objectivity and selective understanding (e.g., easy)
- Because knowledge is coloured by values, preferences, beliefs, and limited experience of limited situations there is always the challenge of overcoming bias



**It's not a matter of  
what is true that  
counts but a matter  
of what is perceived  
to be true  
- Henry Kissinger**

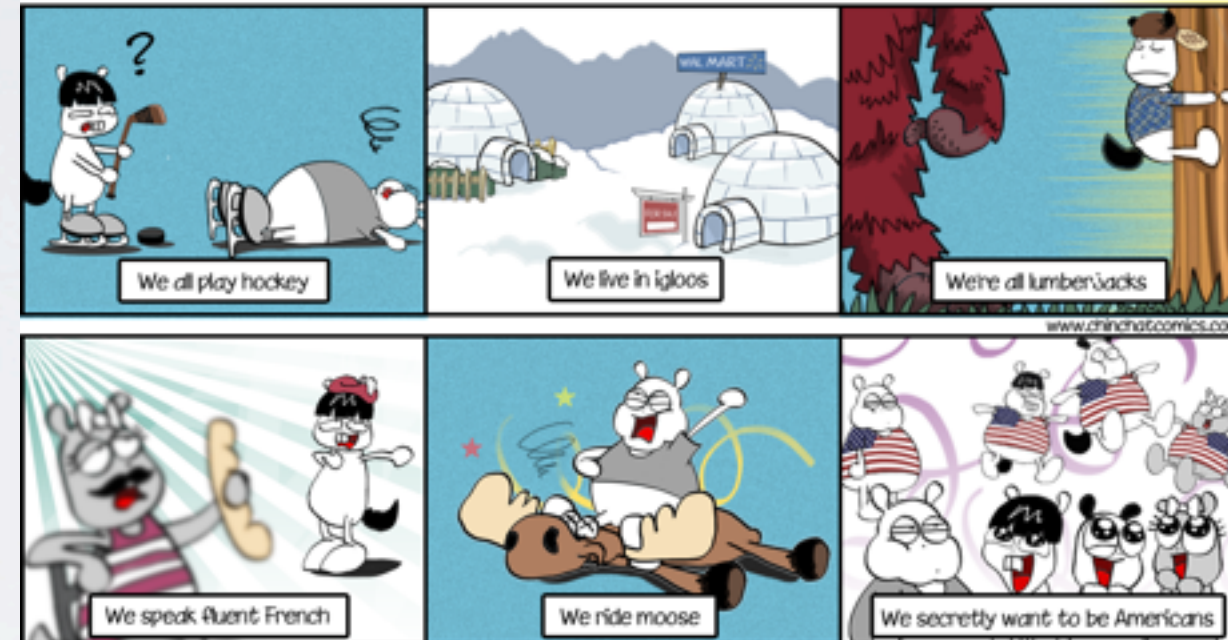


# SOURCES OF BIAS

*"Research suggests that a less biased forecast is not necessarily a more accurate forecast"*

- Inaccurate observation
- Overgeneralize
- Selective observation - source of prejudice & labeling
- Made-up information
- Illogical reasoning
- Ego involvement

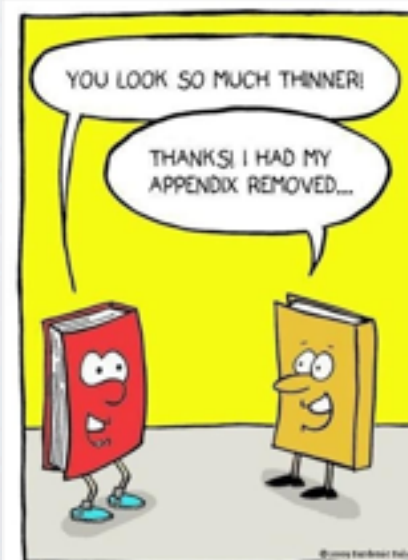
## CANADIAN STEREOTYPES





# HOW DO YOU KNOW WHAT YOU KNOW?

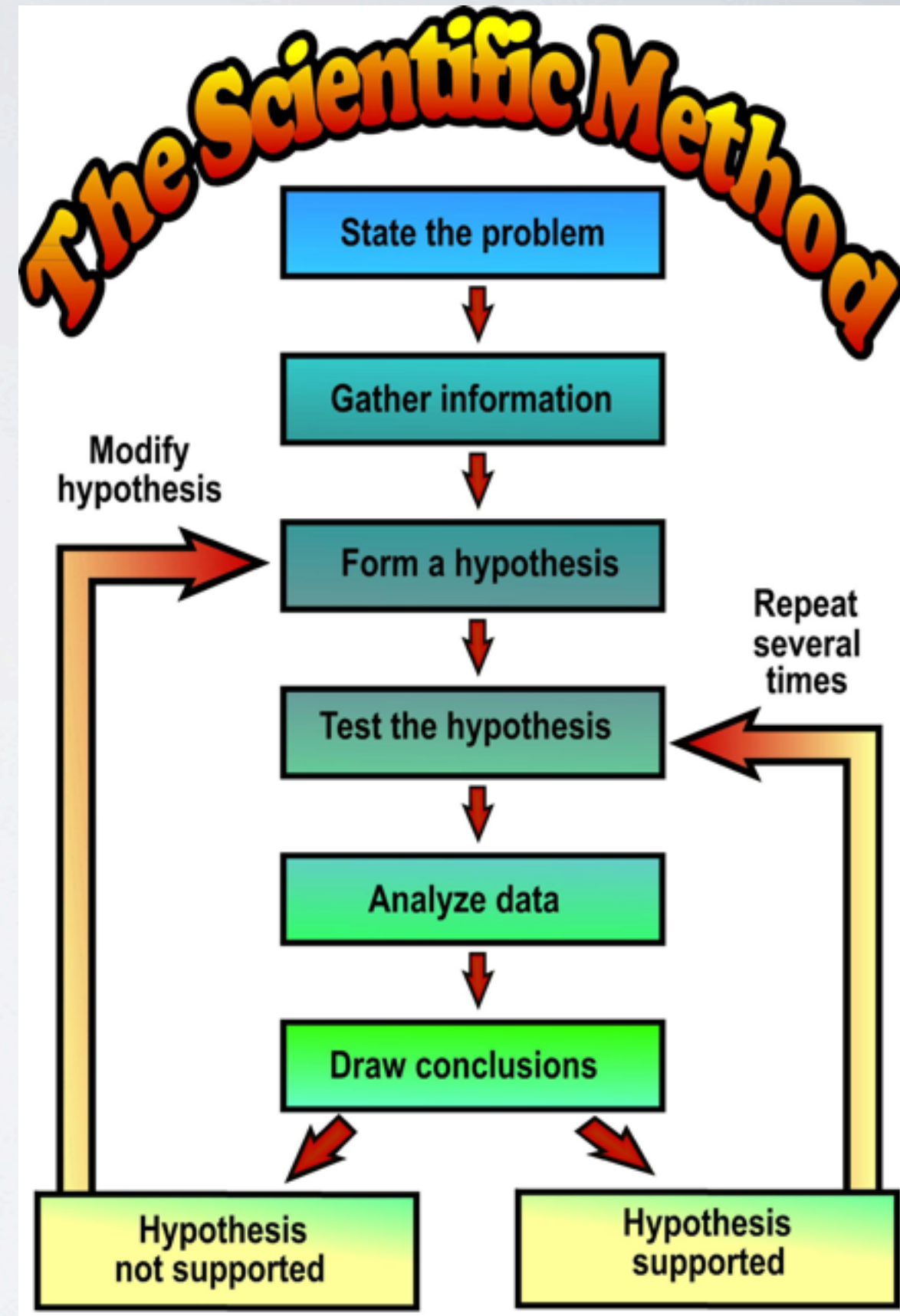
- What is the nature of knowledge?
- The issue of subjectivity
- This problem of relativity or bias is a problem for both the researcher and for science.
- In the case of the latter, a logical system for scientific inquiry is believed to be a solution.
- For the former, we need to consider the issues that are salient for the philosopher of science.





# THE STRUCTURE OF SCIENTIFIC INQUIRY

- Start with a question or a problem;
- Review relevant literature, develop a hypothesis (a statement of aggregate tendencies or trends) or a proposition (social regularity or invariance);
- Identify concepts, operationalize concepts, and determine how concepts will be measured;
- Develop a research design (sampling method, method for data gathering, plan for data analysis -qualitative vs quantitative);





# SCIENTIFIC INQUIRY, CONT'D

- Gather data (subjective vs objective)
- Analyse data (code vs immersion)
- Interpret and generalize vs hypothesis testing
- There is choice with scientific approach; choices largely determined by judgements w/in Philosophy of Science



Testing A  
Hypothesis

"Research consists in seeing what everyone else has seen, but thinking what no one else has thought."

Albert Szent-Gyorgyi



All things are subject to interpretation. Whichever interpretation prevails at a given time is a function of power and not truth.





# PHILOSOPHY OF SCIENCE

- Concerned with underlying judgements about how scientific knowledge comes to be scientific
- Metaphysics - ultimate nature of existence, reality and experience
- Epistemology - investigates origin, nature, methods and limits of human knowledge
- Ontology - studies the nature of existence (e.g., what is real, what is “truth,” what is “knowing”)



Nothing in all the world is  
more dangerous than  
sincere ignorance and  
conscientious stupidity.

Martin Luther King, Jr.



# META - THEORETICAL ASSUMPTIONS

- Static/Dynamic
- Objective/Subjective
- Qualitative/Quantitative -
- Structure/Process
- Continuous/Discontinuous
- Idiographic (unique)/Nomothetic (repeating)
- Micro/Macro
- Individual/Society
- Inductive/Deductive
- Realism/Idealism

The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.

-F. Scott Fitzgerald





# LALLY AND HOWE

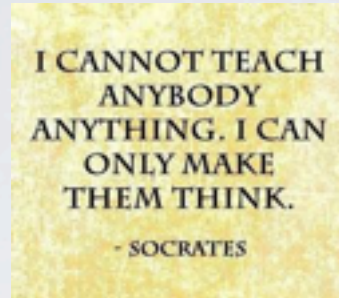
- Lally: Juxtaposes Ideal/Real and Subjective/Objective = Positivism, Structural Determinism, Interactionism, Emancipationism
- Howe: Juxtaposes Regulation/Radical Change and Subjective/Objective = Functionalists (Fixers), Radical Structuralists (Revolutionaries), Interpretivists (Seekers after meaning), Radical humanists (Raisers of consciousness)

Real	
Interactionism	Positivism
Subjective	Objective
Emancipationism	Structural Determinism
Ideal	



# HISTORICAL PERSPECTIVE

- Greek philosophers - 500 - 300 BC (Heracticus, Democritus, Plato)



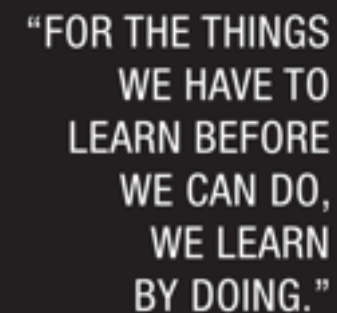
I CANNOT TEACH  
ANYBODY  
ANYTHING. I CAN  
ONLY MAKE  
THEM THINK.  
- SOCRATES

- Truth does not stem from sensory experience; only reason (rationalism) leads to truth. (Mathematical rationalism)
- Descartes - 1600s
  - Accepts mathematical rationalism and tries to apply mathematical methods to philosophy.



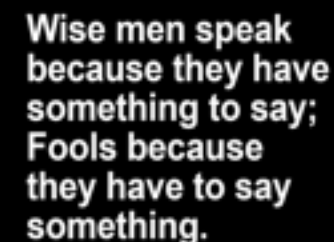
Opinion is the  
medium  
between  
knowledge and  
ignorance.

- Plato



"FOR THE THINGS  
WE HAVE TO  
LEARN BEFORE  
WE CAN DO,  
WE LEARN  
BY DOING."

ARISTOTLE



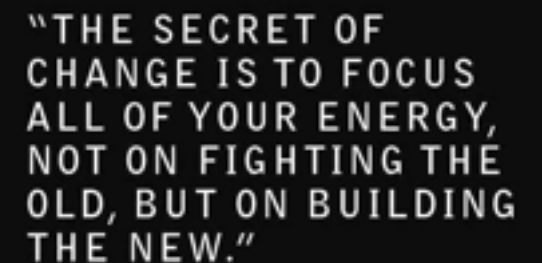
Wise men speak  
because they have  
something to say;  
Fools because  
they have to say  
something.

Plato - Greek Philosopher  
www.greekphilosophy.com



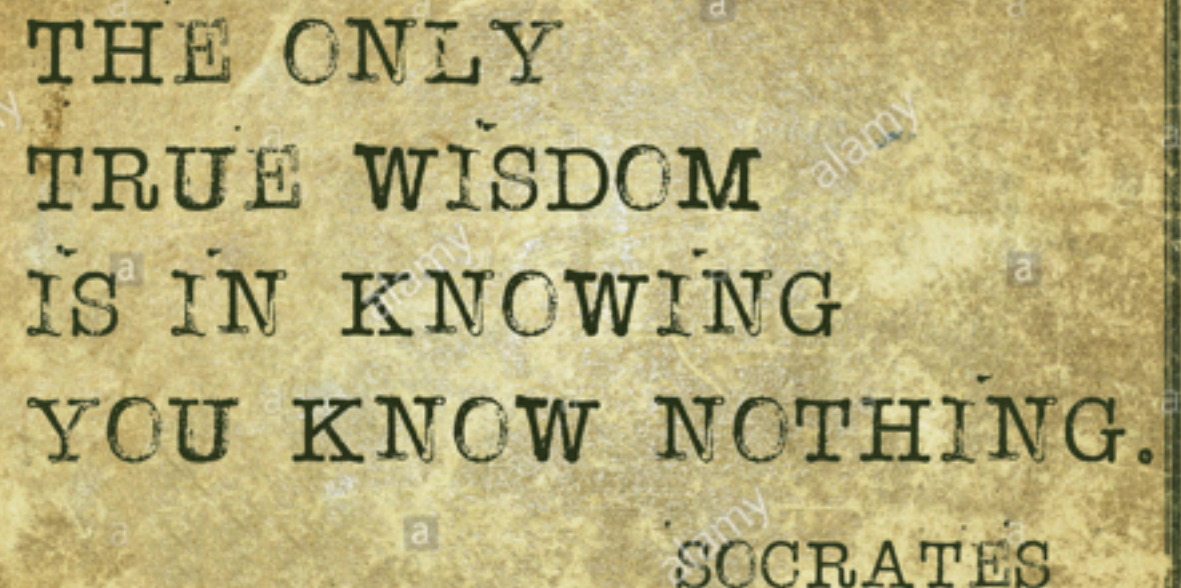
There is nothing  
permanent  
except **CHANGE**.  
Heraclitus

alamy stock photo



"THE SECRET OF  
CHANGE IS TO FOCUS  
ALL OF YOUR ENERGY,  
NOT ON FIGHTING THE  
OLD, BUT ON BUILDING  
THE NEW."

- SOCRATES



THE ONLY  
TRUE WISDOM  
IS IN KNOWING  
YOU KNOW NOTHING.  
SOCRATES



# DESCARTES

In his attempt to apply mathematical methods to philosophy, Descartes took universal doubt for his fundamental premise. One thing, although, could not be doubted: doubt itself. What, then, leads out of this dilemma into truth? Only the rational faculties of the human mind. According to Descartes, truth is whatever I understand clearly and precisely. Every concept that is clear and distinct in itself possess in this, its thinkability or possibility, the guarantee of its validity. From absolute doubt, Descartes proceeded to the absolute certainty of his meditation - I think therefore I am. (Problem of intersubjectivity - does not overcome the problem of relativism)





# LOCKE AND HUME, 1600/1700S

- British empiricism
- We only have knowledge of objects through perception, through sensory experience. We do not possess absolute knowledge.
- Foundation for qualitative methods

**NO MAN'S  
KNOWLEDGE  
HERE CAN GO  
BEYOND HIS  
EXPERIENCE.**

**"IT IS  
ONE THING  
TO SHOW  
A MAN  
THAT HE IS**

**in  
ERROR,**

JOHN LOCKE

**AND  
ANOTHER TO  
PUT HIM IN  
THE POSSESSION  
of TRUTH."**

**THE ACTIONS OF  
MEN ARE THE  
BEST  
INTERPRETERS OF  
THEIR THOUGHTS.**

**TO HATE, TO LOVE,  
TO THINK, TO FEEL,  
TO SEE; ALL THIS IS  
NOTHING BUT TO  
PERCEIVE.**

QUOTEHD.COM

David Hume  
Scottish Philosopher

**BEAUTY IN THINGS  
EXISTS IN THE MIND  
WHICH CONTEMPLATES  
THEM.**



# KANT - LATE 1700S (GERMAN)

- In his *Critique of Pure Reason* was instrumental in ending the deadlock between empiricism and rationalism - he allowed both sense perception and reason.
- Kant delimited the area of human knowledge by demonstrating that the only certain and rational type of knowledge is phenomenal knowledge, the knowledge of the universe which we receive through the senses. Our knowledge of this outer world is not an exact reflection of it, for the unity which we see in this world is something given it by the instrumentalities of the mind, first by the a priori forms of the intuition - space and time - and then by the schemata and the categories of understanding. Thus, the human mind lends form to the world surrounding it and, ultimately, makes it intelligible to itself. We are, therefore, forever barred from knowing absolute reality, the world of "things in themselves," which Kant fathomed beyond the forms of time and space. Ideas such as God, immortality, and freedom, the main objects of traditional metaphysics, can never be proven or disproven by way of scientific inquiry. They must be left to the other great sphere of human existence - belief.

**All our knowledge begins with the senses, proceeds then to the understanding, and ends with reason. There is nothing higher than reason.**

**But although all our knowledge begins with experience, it does not follow that it arises from experience.**



# HUSSERL - 1800S

- Finding truth requires suspension of belief - bracket presuppositions (*a priori* knowledge). Relied on logic and on sensory experience. (Science of essences)
- German phenomenology vs French phenomenology (Existentialism)
- Problem of intersubjectivity

EXPERIENCE BY  
ITSELF IS NOT  
SCIENCE.

QUOTEHD.COM

Edmund Husserl

All consciousness is  
consciousness of something

Edmund Husserl

## PHENOMENOLOGY

Edmund Husserl

Martin Heidegger

THE STUDY OF EXPERIENCE AND HOW WE EXPERIENCE, SUBJECTIVE OR FIRST-PERSON POINT OF VIEW, ALONG WITH ITS "INTENTIONALITY".

CONSIDERED A BRANCH OF METAPHYSICS AND OF PHILOSOPHY OF MIND. MORE A DISTINCT WAY OF LOOKING AT PHILOSOPHY. MORE DESCRIPTIVE THAN PRESCRIPTIVE.

CLASSICAL PHENOMENOLOGISTS WERE JEAN-PAUL SARTRE, MAURICE MERLEAU-PONTY, MAX SCHÉLER, EDITH STEIN, DIETRICH VON HILDEBRAND, ALFRED SCHUTZ, HANNAH ARENDT.

MARTIN HEIDEGGER CRITICIZED AND EXPANDED HUSSERL'S PHENOMENOLOGICAL ENQUIRY TO EXPERIENCE OF BEING ITSELF, AND DEVELOPED HIS THEORY OF "DASEIN" THE NON-DUALISTIC HUMAN BEING.

REALITY CONSISTS OF OBJECTS AND EVENTS AS THEY ARE PERCEIVED OR UNDERSTOOD IN THE HUMAN CONSCIOUSNESS.

EXPERIENCE: IMAGINATION, THOUGHT, EMOTION, DESIRE, VOLITION AND ACTION. WHAT MAKES AN EXPERIENCE CONSCIOUS IS AWARENESS WHILE PERFORMING.

THE TERM "PHENOMENOLOGY" IS DERIVED FROM THE GREEK "PHAINOMENON", MEANING "APPEARANCE". HENCE IT IS THE STUDY OF APPEARANCES AS OPPOSED TO REALITY.

"NATURAL OBJECTS, FOR EXAMPLE, MUST BE EXPERIENCED BEFORE ANY THEORIZING ABOUT THEM CAN OCCUR."

EDMUND HUSSERL

"AT THE LOWEST COGNITIVE LEVEL, THEY ARE PROCESSES OF EXPERIENCING, OR, TO SPEAK MORE GENERALLY, PROCESSES OF INTUITING THAT GRASP THE OBJECT IN THE ORIGINAL."

EDMUND HUSSERL



# DURKHEIM AND SOCIOLOGY

- Social facts
- Social science as distinct from behavioural science (psychology) and mechanistic (deterministic) theories of Spencer and Darwin.
- Contrast with German sociology (Weber and his reliance on Dilthey and concept of *verstehen*)

**The only power that can decrease the egoism is the strength of the group**

~ Emile Durkheim ~



**Any theory intended to describe and analyze socio-historical reality cannot restrict itself to the human spirit and disregard the totality of human nature.**

QUOTEHD.COM

Wilhelm Dilthey  
German Historian

**From the perspective of mere representation, the external world always remains only a phenomenon.**

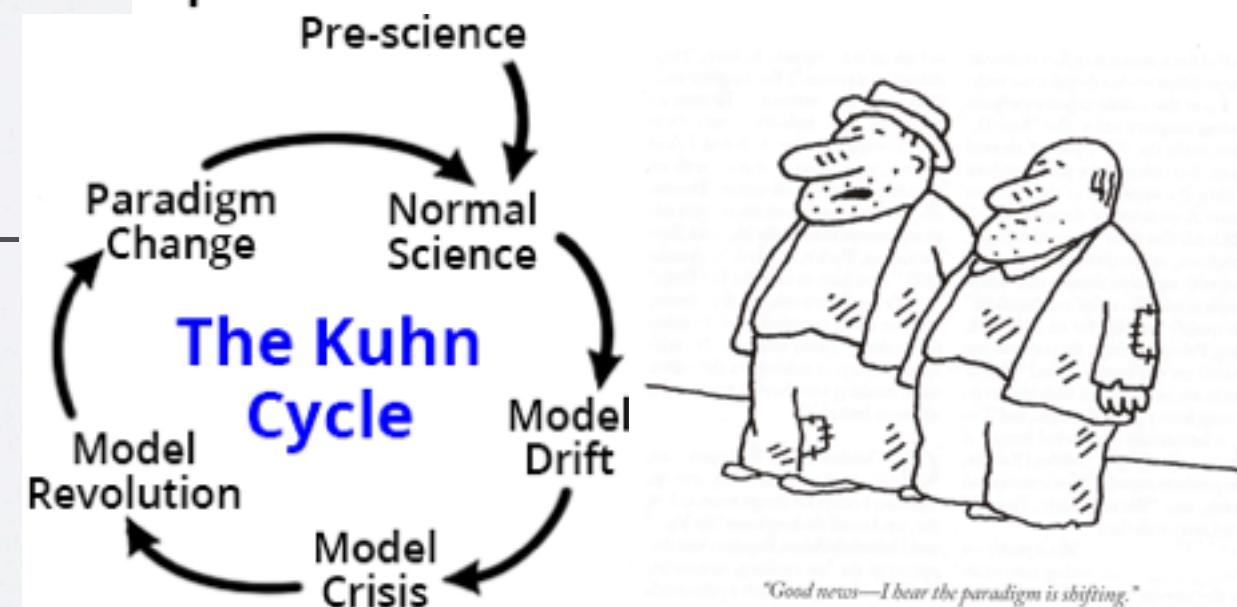
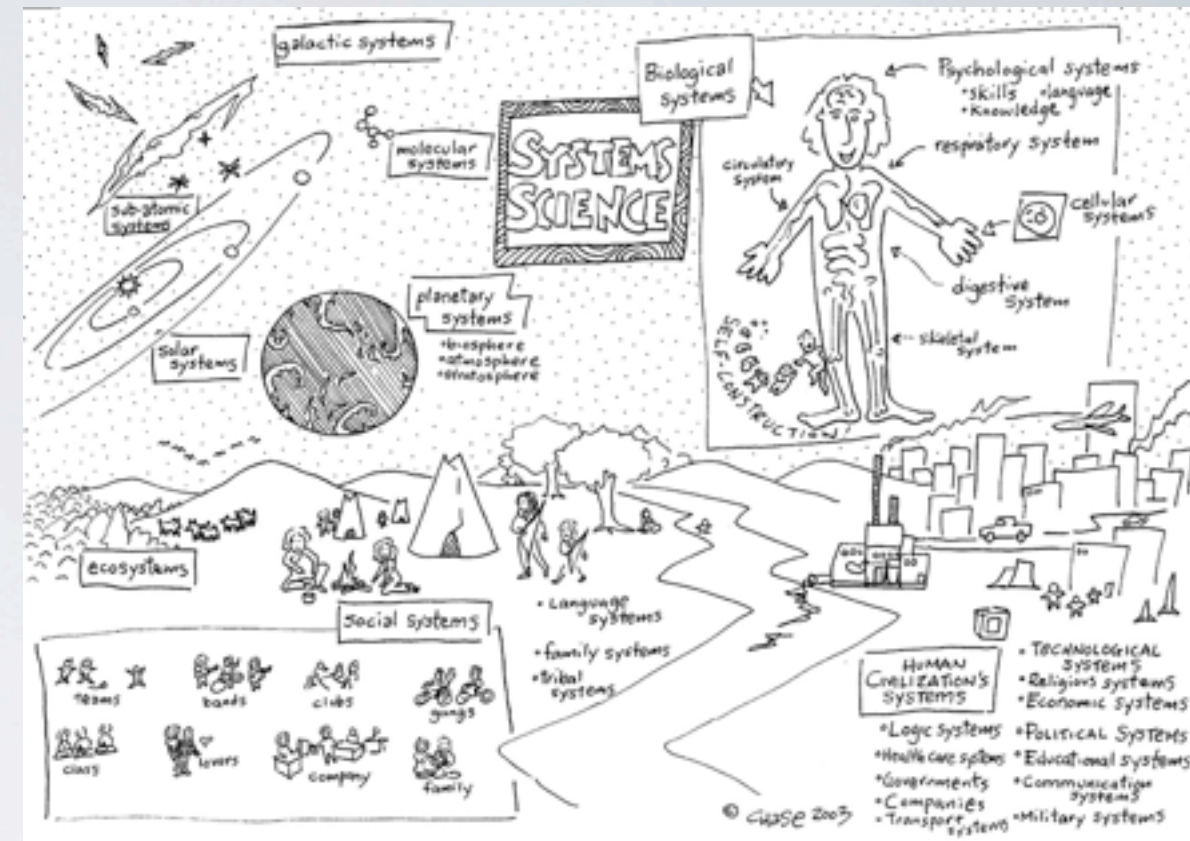
QUOTEHD.COM

Wilhelm Dilthey  
German Historian



# CURRENT PARADIGMS

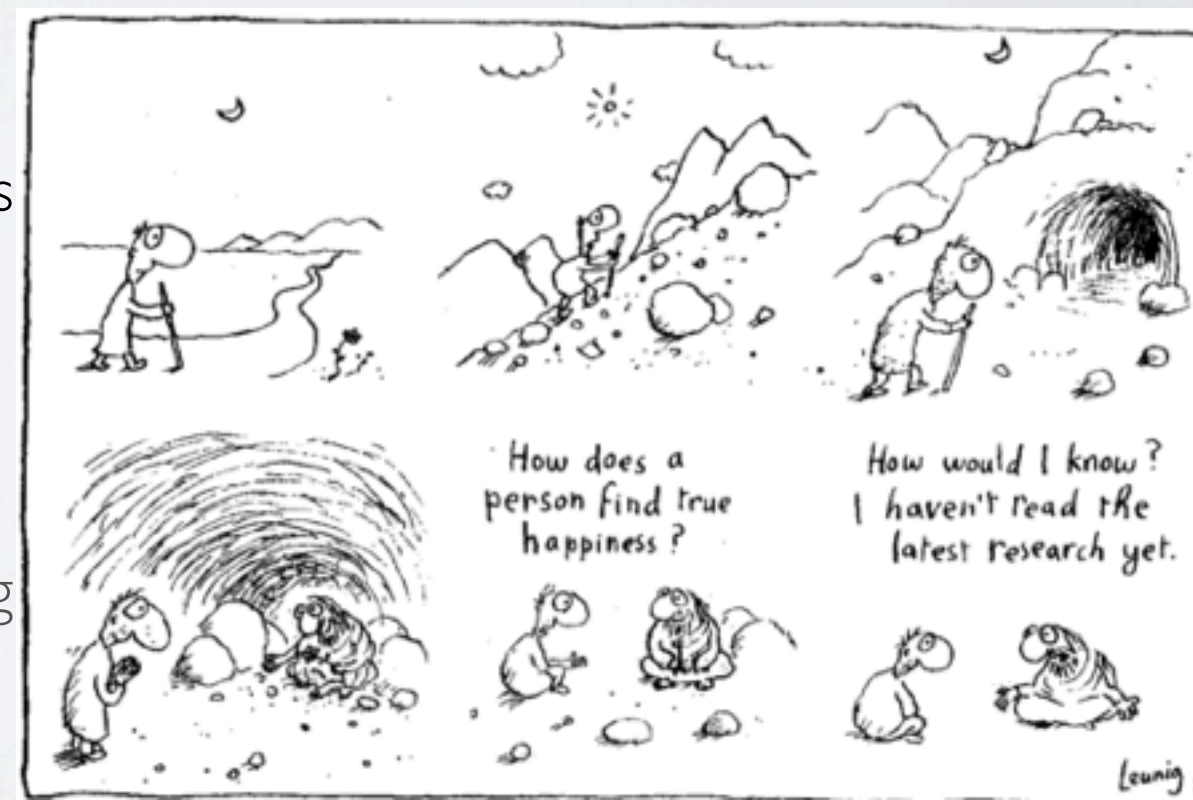
- Quantitative = rationalism (mathematical model) - can reality be reduced to mathematics and logic?
- Qualitative = empiricism (sensory) - can sensory experience be trusted?
- “Post modernism” = extension from doubt to Frankfurt School and critical theorists
- Issue of shifting/multiple paradigms - Kuhn (Newton & gravity; Einstein & relativity)





# POSITIVISM - REALISM

- Based on mathematical rationalism and realism
- Greek Philosophers -> DesCartes (universal doubt) -> Kant (reason) -> Durkheim/Structural-Functionalists -> Systems theory ->
- Basic elements:
  - **Phenomenalism** - the ultimate reality or focus of science is that which is experienced through the senses metaphysics and morality are irrelevant to scientific pursuit.
  - **Instrumentalism** - operationalism or objectivism. Scientific knowledge is based on examination or testing procedures that could be used to make systematic or standardized observations across a range of cases.





# BASIC ELEMENTS

- **Verification** - Scientific knowledge, in principle, is subject to confirmation by independent observers.
- **Cumulative unity of the sciences** - Science refers to a body of knowledge, which has the potential to achieve coherency with continued inquiry.
- **Implied causality** - Objects exist in states of relationships with one another, such that one may infer covariation, sequentialism, and determinism through inquiry.
- **Enabling control** - The purpose of science is to develop a series of factual statements and generalizable principles designed to foster the understanding, prediction, and control of objects.
- **Methodological unity of the sciences** - The methodology of science is generalizable across the realms of objects involving awareness through the human senses.
- **The existence of human analogues** - The essential methodological orientation and practices of positivist physical sciences should be applied to the study of human behaviour.



## Positivism & Anti-positivism

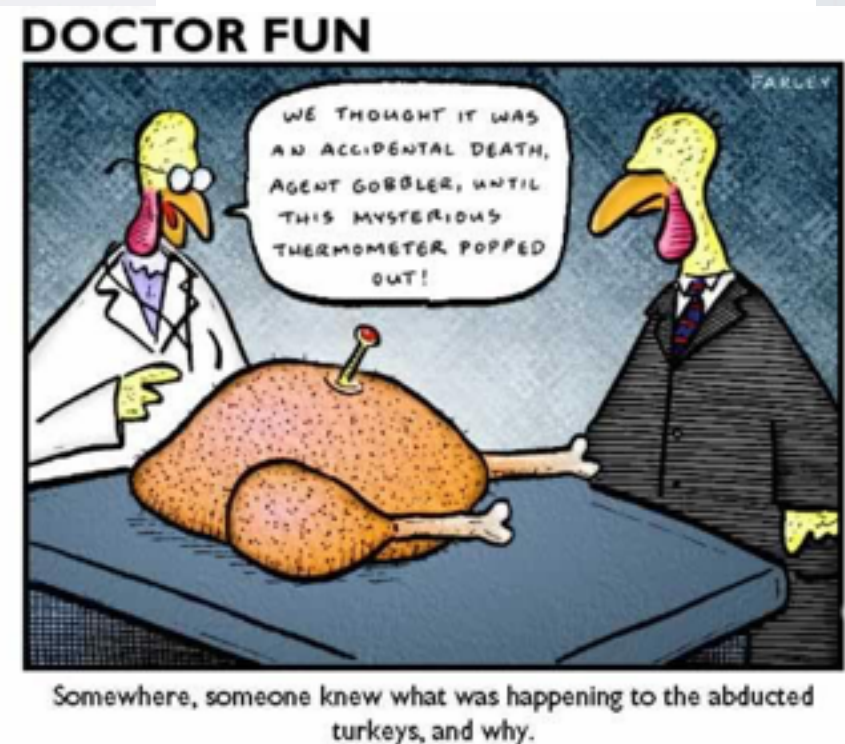
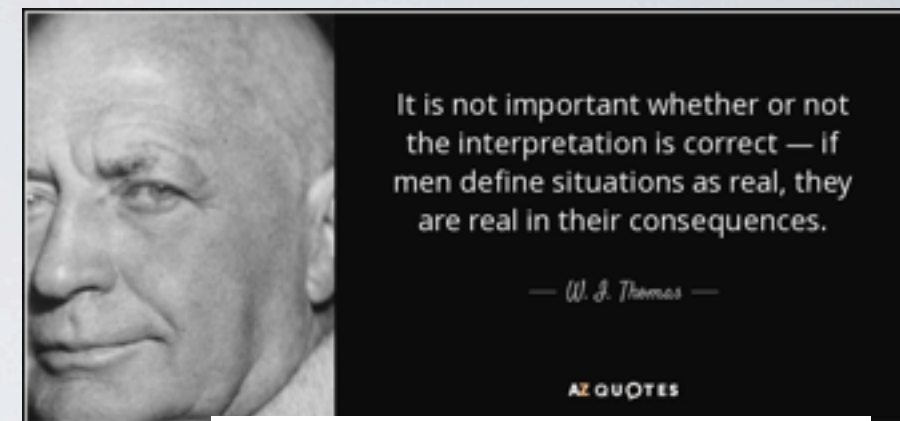
What is this? Which do I use?

**Anti-positivism** is the view in social science that the methods and processes of research used in natural science may not apply to the social sphere. Anti-positivistic research should focus on understanding the meanings and implications of social behaviour instead of empirical and scientific methods.



# INTERPRETIVISM & INTERACTIONISM

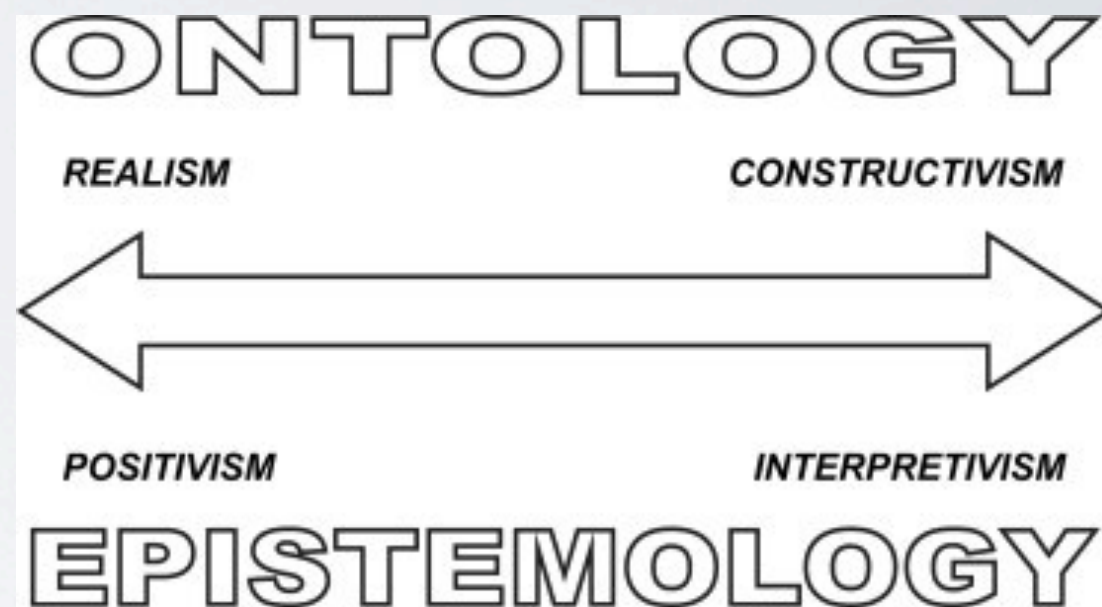
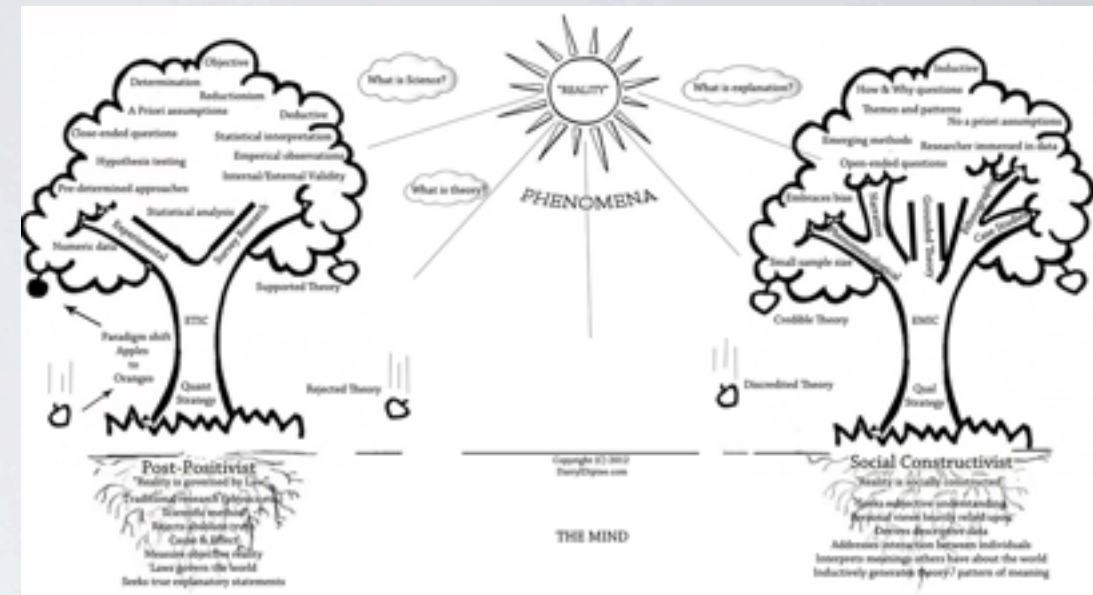
- Skepticus -> Locke and Hume (Empiricism) -> DesCartes (universal doubt) -> Husserl (phenomenology - science of essences) -> Dilthey/Weber (verstehen) -> James/WI Thomas/ Mead/Blumer (symbolic interactionism)
- Posits that those assuming a positivist or structuralist approach to the study of human behaviour have neglected or violate essential features of the human condition. In attempting to model themselves after the physical sciences, these scholars have not only disattended to the human capacities of reflectivity, action, and interaction, but they also have been relatively oblivious to the interpretive and interactive nature of all scientific enterprise.





# AN INTERPRETIVIST VIEWPOINT

People doing research in the physical and social sciences may be seen to engage in somewhat parallel activities, but the hermeneutic subject matter of the human sciences is notably different from the subject matter with which the physical sciences deal. It was on this basis that Dilthey insisted that the study of human lived experience required a methodological orientation different from that implied in the study of nonminded objects. Thus, the problem created by positivist social scientists is one of attempting to employ a method used in the study of one type of object to a different type of object (fallacy of methodological reductionism). The result has been a displacement of human intersubjectivity and activity with the impersonal agency implied in structures, factors, or variables through which some set of overall behavioural effects are produced in the population under consideration. Instead of attending to the life-worlds that people experience from the viewpoints of those who are actively involved in constructing (and maintaining or changing) those life-worlds, those adopting positivist approaches essentially treat people as mediums through which alleged forces or factors find expression. Interpretivism accepts the scientific paradigm; scientific social research is pursued through methods that are interactive and that interpret the data from within its socio-politico-historical place.





# “POSTMODERNISM” (IDEALISM)

- Skepticus -> Locke and Hume (Empiricism) -> DesCartes (universal doubt) -> Husserl (phenomenology - science of essences) -> Marx/Engels/etc (class structure/false consciousness) -> Foucault/Feyerabend (against method/interpretation)
- At the heart of postmodernist thought is an extreme or complete skepticism of, or disbelief in, the authenticity of human knowledge and practice. Accordingly, all claims of expertise and science are invalidated or at least are considered no more viable than any other “stories, narratives, fictions, myths or accounts. Partially shaped by the Nietzschean tenet that language is the first and great lie, all versions of reality are considered instances of self-perpetuating myths. At best, postmodernists contend, humans may convince themselves to think that they know something, when in actuality, all that is known is but another version of a myth, another linguistic or textual reality which has no truth value beyond itself.





- In recent years, the interpretive critique of positivist social science has been both supported and confounded by those promoting a postmodernist viewpoint. Although the postmodernists (poststructuralists, deconstructionists) may be seen as interpretivists of sorts, postmodernism is characterized by an extreme skepticism in the viability of all forms of knowing (and presumably all interpretation as well).
- Postmodernist thought is very much inspired by the skepticisms and subjective idealisms of Friedrich Nietzsche, Henri Bergson, Martin Heidegger, and Ludwig Wittgenstein.

And those who were seen  
dancing  
were thought to be insane  
by those  
who could not hear  
the music.

— Friedrich Nietzsche

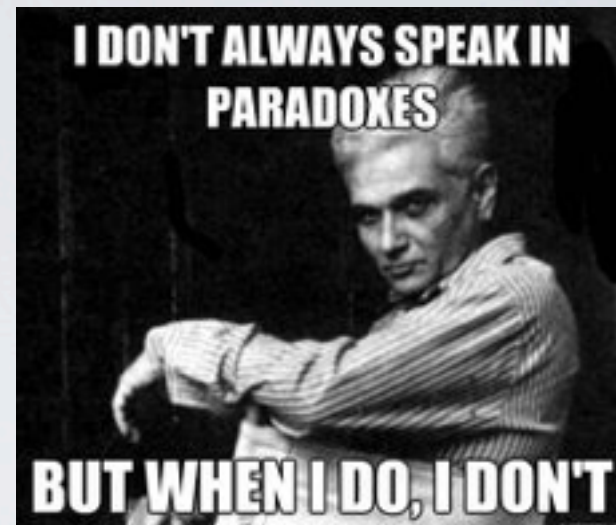
**PEOPLE DON'T  
WANT TO HEAR  
THE TRUTH  
BECAUSE THEY  
DON'T WANT  
THEIR ILLUSIONS  
DESTROYED.**

— FRIEDRICH NIETZSCHE



On a contemporary plane, the term postmodernism has generally been used to refer to the writings of Michel Foucault, Jacques Derrida, Jean Baudrillard, and Jean-Francois Lyotard. There are substantial differences of viewpoint among these authors (who have fused their writing variously with aspects of the phenomenology of Husserl, the hermeneutics of Heidegger, images of power and exploitation characterizing Marxist structuralism, and notions of self deception and unconscious motivation associated with Freudian analysis), but all of these commonly acknowledged postmodernists are disposed to view knowledge skeptically, as a rather arbitrary form of linguistic expression.

By explicitly emphasizing, dramatizing, and exploiting inconsistencies they've noted (or created) in the human fabric of community life, postmodernist writers have attempted to shock (sometimes embarrassingly, sometimes entertainingly) audiences into a state of disbelief regarding the integrity of human beliefs and practices. In Nietzschean style, they've argued that all human constructions are capricious and arbitrary; none is absolute or correct beyond its own contextual or situation validations. Given the relative, situated nature of human knowledge and practices, no knowledge claims, they argue, should be privileged over any others.



**WE ARE ALL  
MEDIATORS,  
TRANSLATORS.**

QUOTEHD.COM

Jacques Derrida  
French Philosopher

**“PEOPLE KNOW  
WHAT THEY DO;  
FREQUENTLY THEY  
KNOW WHY THEY DO  
WHAT THEY DO; BUT  
WHAT THEY DON'T  
KNOW IS WHAT WHAT  
THEY DO DOES.”  
MICHEL FOUCAULT**

A dark, grainy photograph of a prison interior, showing many people walking in a large hall. The text is overlaid in white, bold, sans-serif capital letters.

**“IS IT SURPRISING THAT PRISONS  
RESEMBLE FACTORIES, SCHOOLS,  
BARRACKS, AND HOSPITALS,  
WHICH ALL RESEMBLE PRISONS?”**

**MICHEL FOUCAULT**  
*DISCIPLINE AND PUNISH (1975)*



# GENERATION OF INQUIRY & PROBLEM FORMULATION

- Where do ideas from research come from?
  - basic curiosity
  - personal experience - part of our biography or personal history
- current problems or issues
- anticipation of future problems or issues

**I HAVE NO SPECIAL  
TALENTS. I AM ONLY  
PASSIONATELY  
CURIOUS.**  
**-ALBERT EINSTEIN**



**"We keep moving forward,  
opening new doors,  
and doing things  
because we're curious  
and curiosity keeps leading  
us down new paths."**

**WALT DISNEY**



# ALL SCIENTIFIC INQUIRY STEMS FROM A PROBLEM

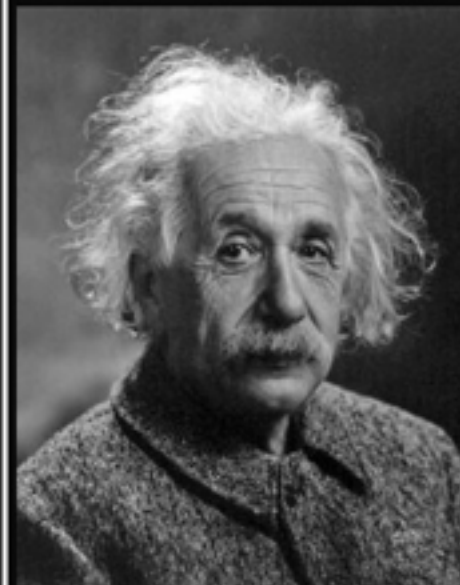
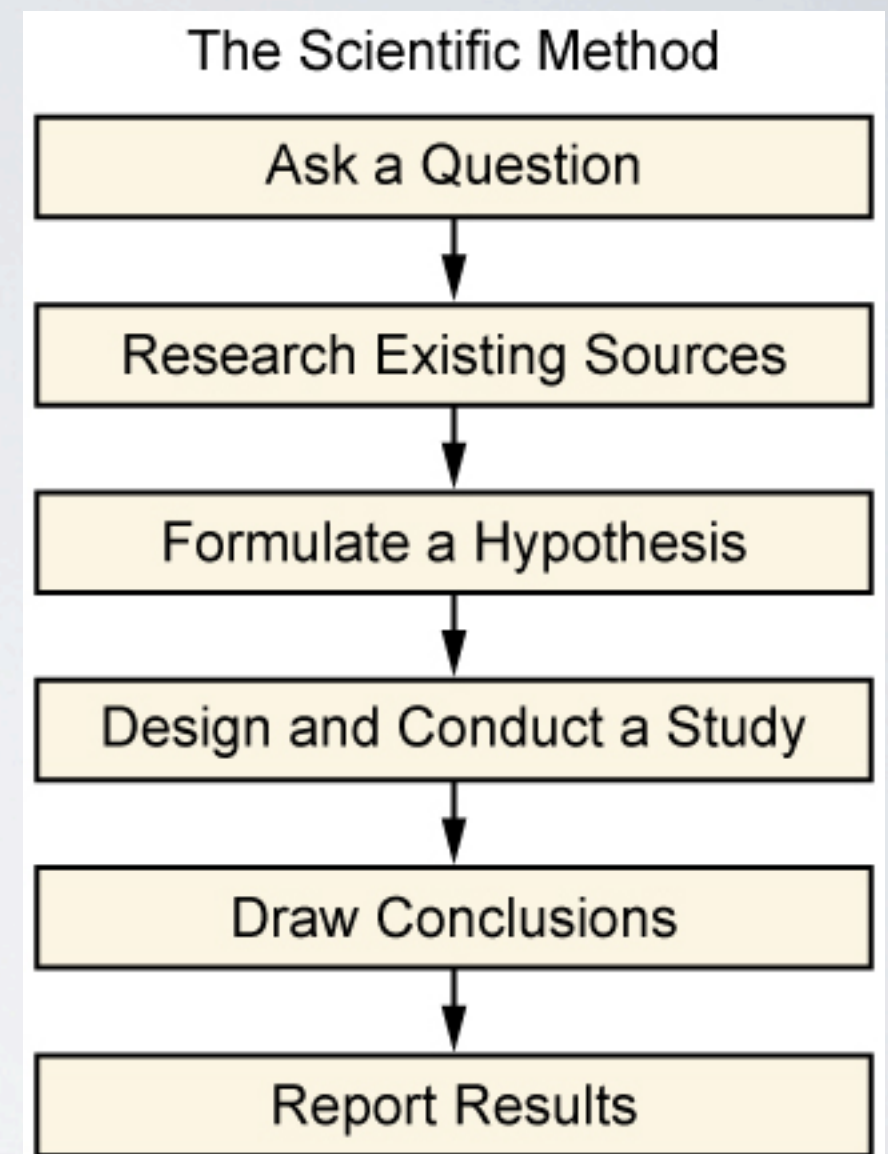
- who will vote for which candidate
- what types of clients respond to behaviour modification
- where is poverty most prevalent
- when does an alcoholic seek help
- why.....gets at the implications underlying each question (asks for a more complex kind of relationship - a causal relationship -- necessary or sufficient conditions)
- Add question of "how" - Gubrium and Holstein: what + how = why





# 8 STAGES OF SCIENTIFIC APPROACH

- Formulation of problem - statement of empirically testable proposition
- Review pertinently relevant literature
- Construct research design
- Determine universe and sample
- Gather data and process into workable form
- Interpretation of data
- Verification of interpretation
- Presentation of findings



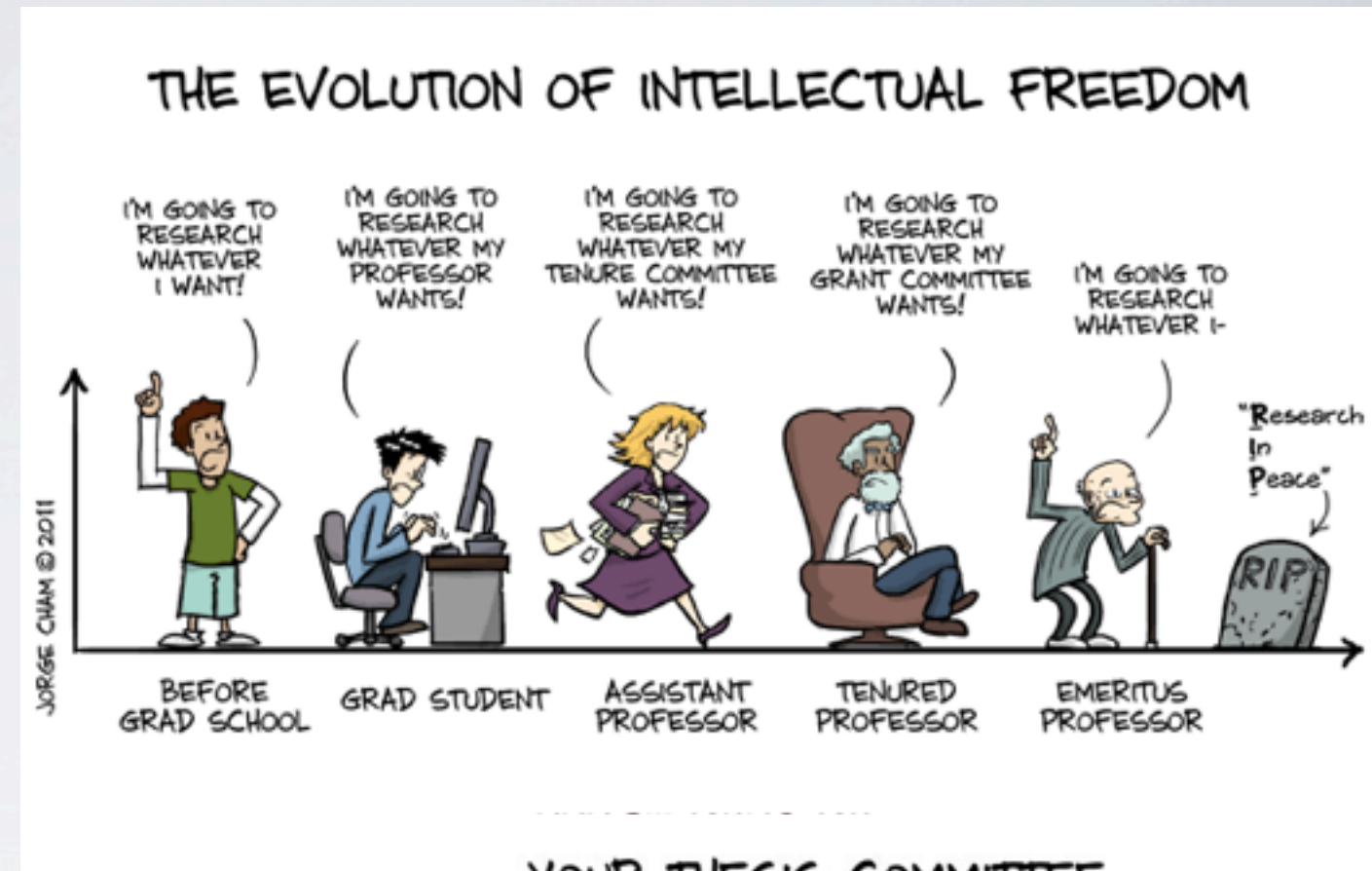
The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill.

(Albert Einstein)



# POLITICS OF A DISSERTATION

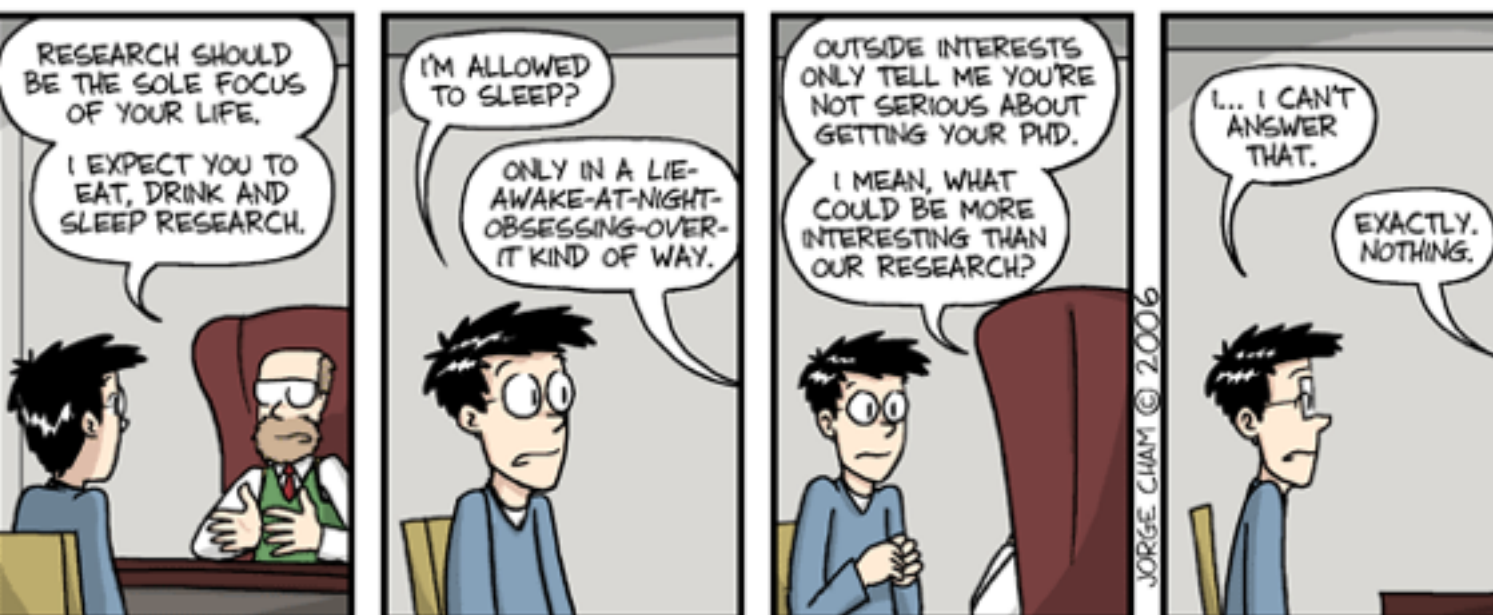
- Methodological orientation
- Theoretical orientation
- Committee members and examiners
- ???



JORGE CHAM © 2012

## YOUR THESIS COMMITTEE

Also known as: an impossibly difficult group to get together in one room but who nevertheless hold your future in their hands depending on their ability to reach a civilized consensus.





# CRITERIA FOR QUESTION

- Must be suitable for scientific inquiry - clearly stated and must mean the same thing to any intelligent or informed person. Complex questions should be broken into two distinct questions. Vague and ambiguous questions should be avoided.
- Must be answerable by available methods and by available sources of data.
- Should be answerable in “objective” terms - agreement upon a standard of measurement or upon a definition of the evidence to be sought.
- Avoid value-laden questions, or questions which attempt to prove a value-based belief.



We cannot solve our  
problems with the same  
thinking we used when we  
created them.

ALBERT EINSTEIN



# GENERAL PRINCIPLES

- Be sure problem exists
- Learn as much as possible about problem
- Employ most feasible/efficient methods
- Consider alternate/substitute formulations
- Check for recognition of the phenomena
- Formulate the problem systematically
- Don't try to solve complex problem w/ simple formulations
- Be aware that problem formulation may influence the phenomenon being studied

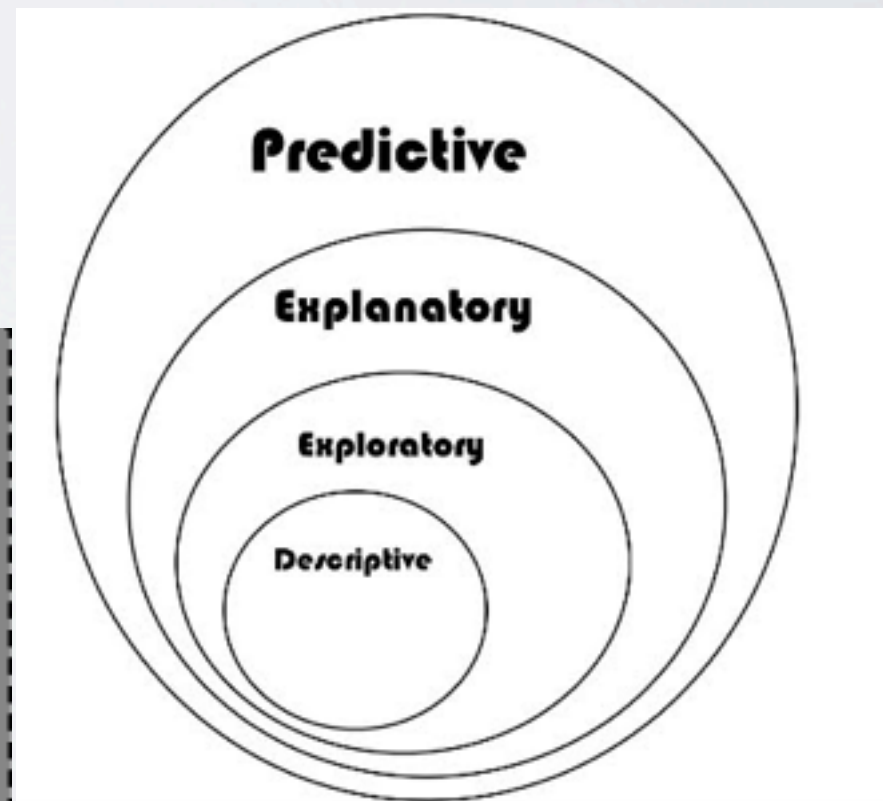
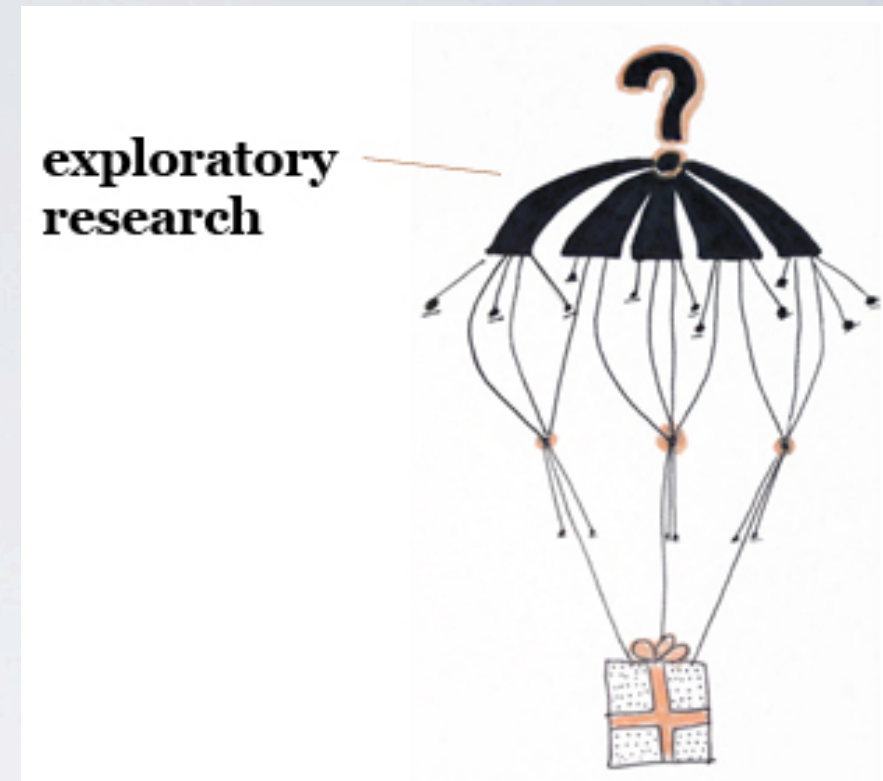


"Chit-chat ground rules: no complaining, yes or no if possible, no jokes over 20 seconds."



# APPROACHES TO PROVIDING EXPLANATION

- Exploratory - no preconceived notions or categories
- Descriptive - oriented to describing phenomenon
- Explanatory - explains the relationship between concepts
- Experimental - look for effect of effectiveness of stimulus/event





# TIMES OF OBSERVATION

- One time only - survey, interview
- Longitudinal - trend studies, process studies, single subject designs
- Ex-post-facto - historical case study, accretion study
- Transversal - repeated cross-sectional (pretest control; posttest experimental)

## Cross-Sectional Studies

- Participants of different ages studied at the same time.



## Longitudinal Studies

- One group of people studied over a period of time.





# MODES OF OBSERVATION

- Unobtrusive measures
- Bibliographic/Theoretical
- Historical
- Simple observation
- Interview/Survey
- Quantitative
- Qualitative



what's the  
opposite of  
unobtrusive?



noticeable, obtrusive, bold,  
conspicuous, confident,  
flaunting, visible, extrovert,  
arresting, eye-catching





# NATURE OF ANALYSIS

- Statistical - descriptive versus explanatory
- Comparative
- Discerning patterns

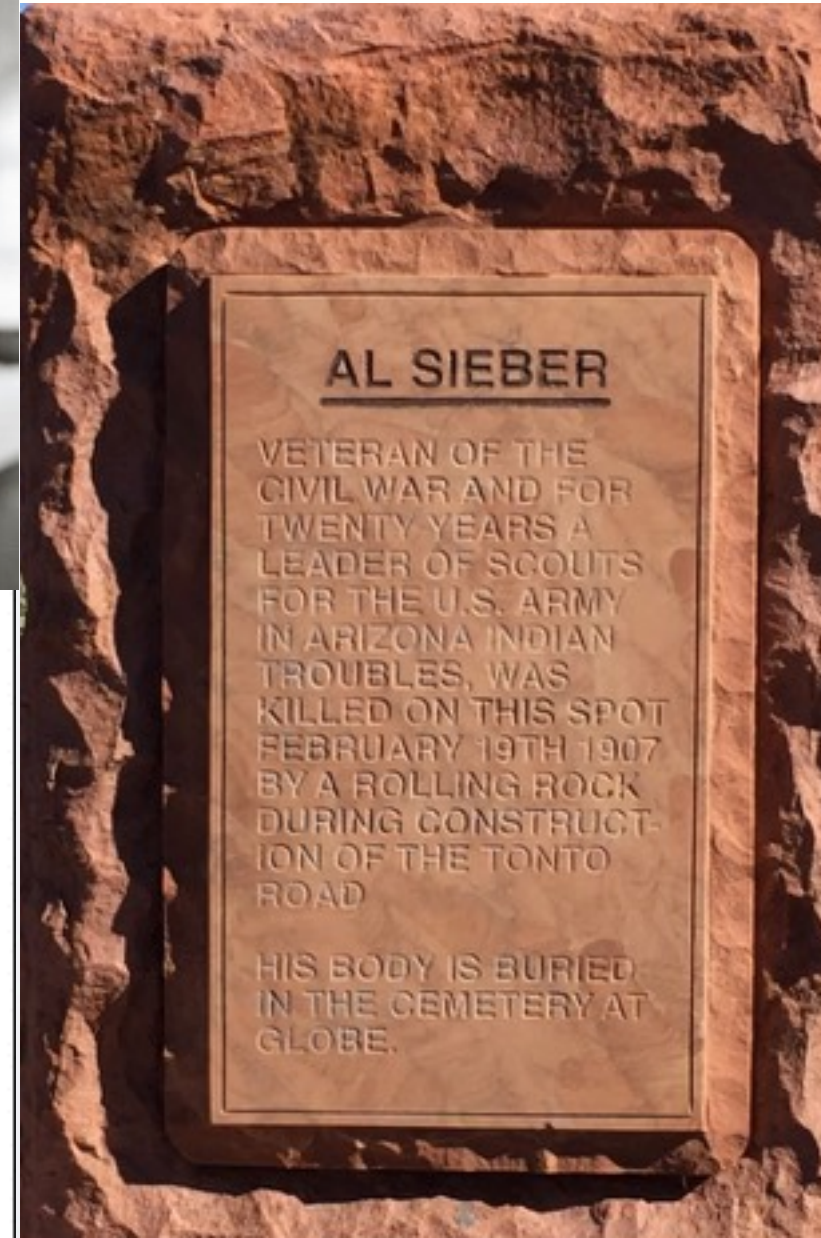
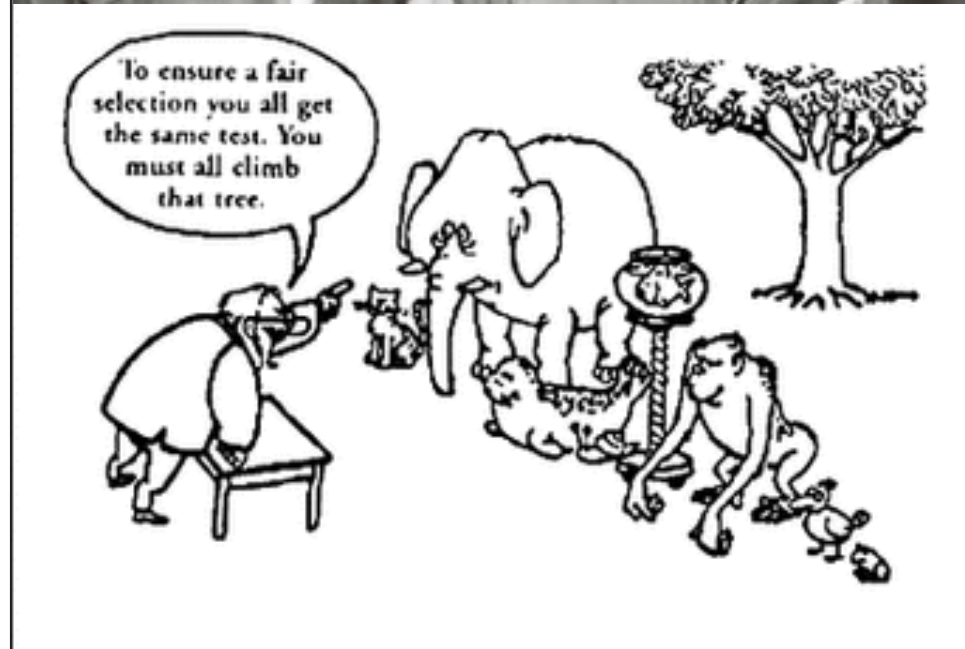
## Regression analysis

FITS A STRAIGHT LINE TO THIS MESSY SCATTERPLOT.  $x$  IS CALLED THE INDEPENDENT OR PREDICTOR VARIABLE, AND  $y$  IS THE DEPENDENT OR RESPONSE VARIABLE. THE REGRESSION OR PREDICTION LINE HAS THE FORM

$$y = a + bx$$



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# CONCEPTUALIZATION, OPERATIONALIZATION AND MEASUREMENT

## Concept definition

- Any scientific inquiry must begin with a clear definition of each concept (i.e., an idea or a generalized idea of a class of objects) or construct (an idea expressing an orderly arrangement of concepts into a single whole).

## Basic rules of definition

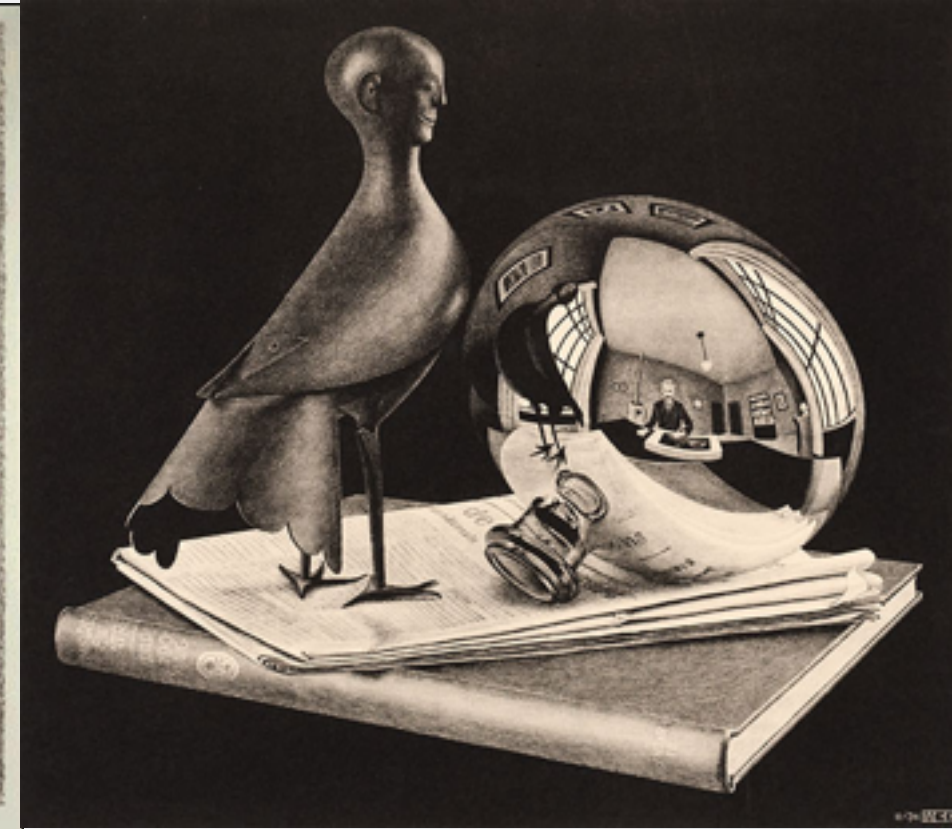
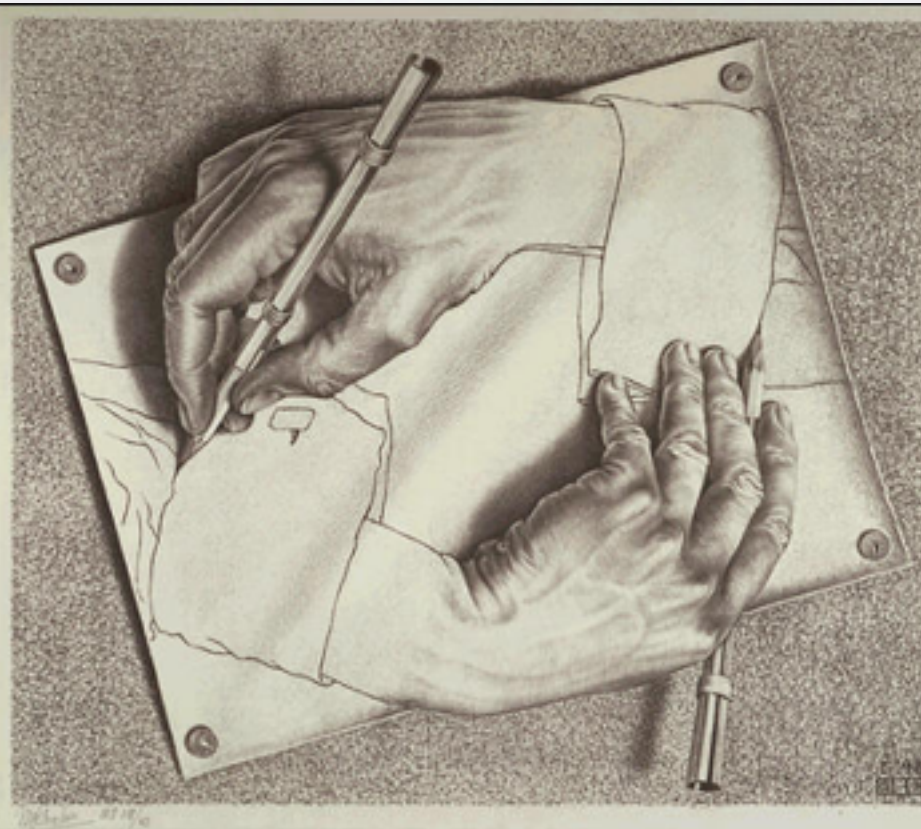
- must denote unique or distinctive qualities of what is being defined
- must be inclusive of all things denoted by it and yet exclusive of all things not denoted by it
- must not be circular - it must not contain within itself either directly or indirectly any part of the thing being defined. Avoid tautology, i.e., defining something by itself, as in "A man is a person having masculine qualities"





# BASIC RULES CONT'D

- should not be stated negatively when it can be stated positively
- should be expressed in clear and unequivocal terms, not in obscure or figurative language. Be precise!
- use “objective,” operational definitions

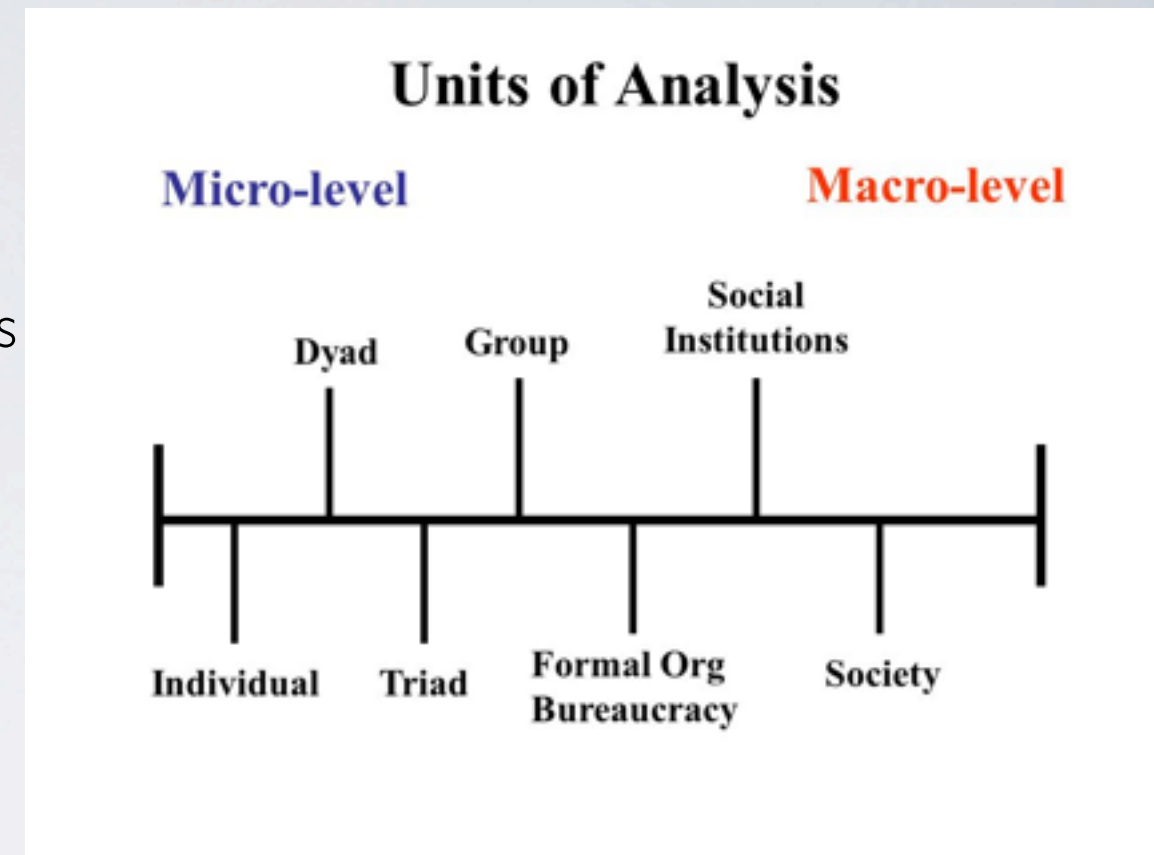




# UNITS OF ANALYSIS

- Clear definitions have their first applicability when a study delineates its specific phenomena of interest. In some instances the phenomena may be gross classes. In most cases, a study is concerned only with specific subclasses of phenomena; thus it must designate such sub-classes in terms of relatively precise units of reference (e.g., income of a particular population, mobility of a social group, viability of an organism or type of group). A satisfactory unit of scientific analysis should possess at least five clarifying attributes:

- Appropriateness - must focus upon essential object of the study
- Clarity - precise and unambiguous
- Measurability - permits quantification or qualitative understanding
- Comparability - units to be compared are of like order
- Reproducibility - possibility for verification and replication





# MEASUREMENT

- Nominal

- Ordinal

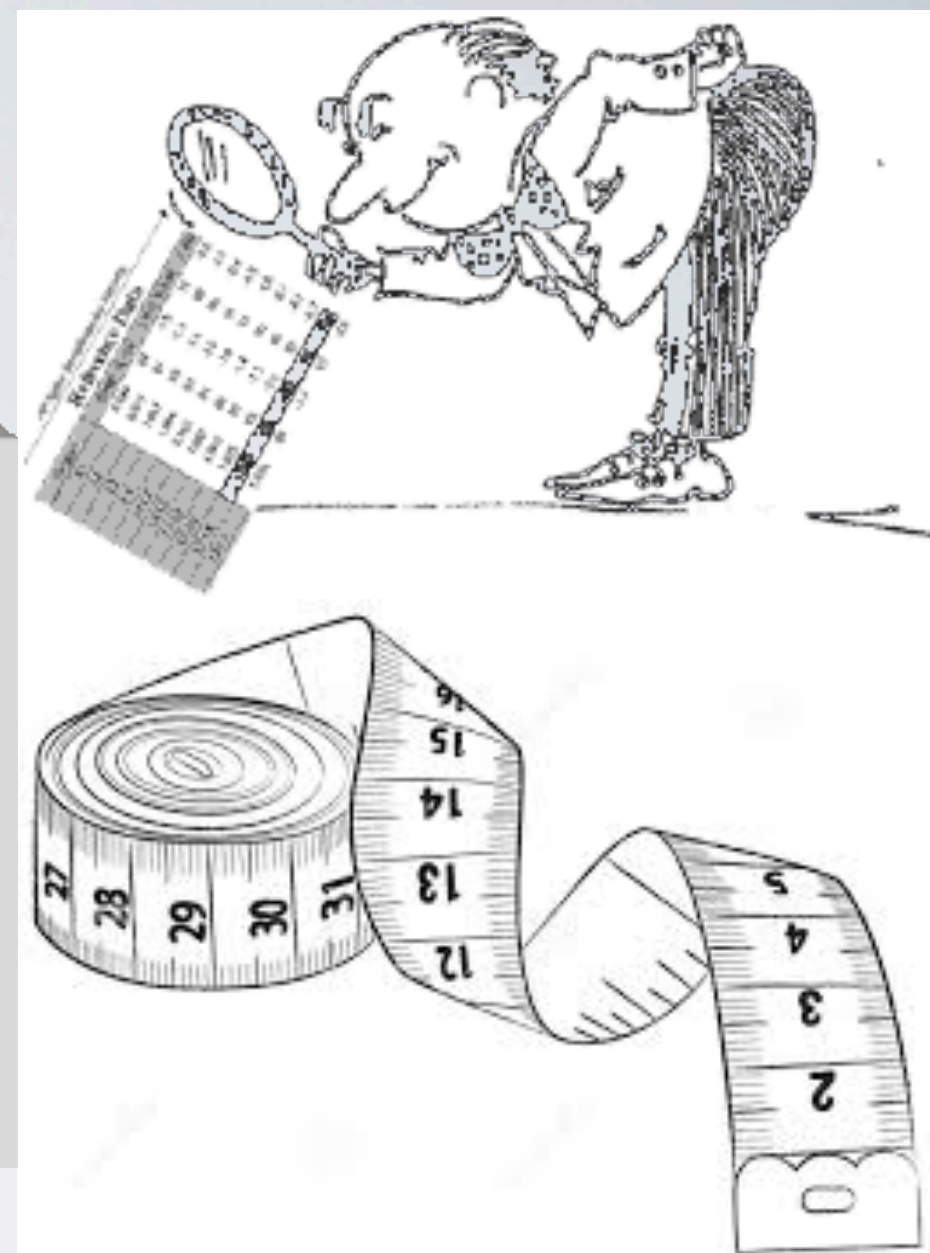
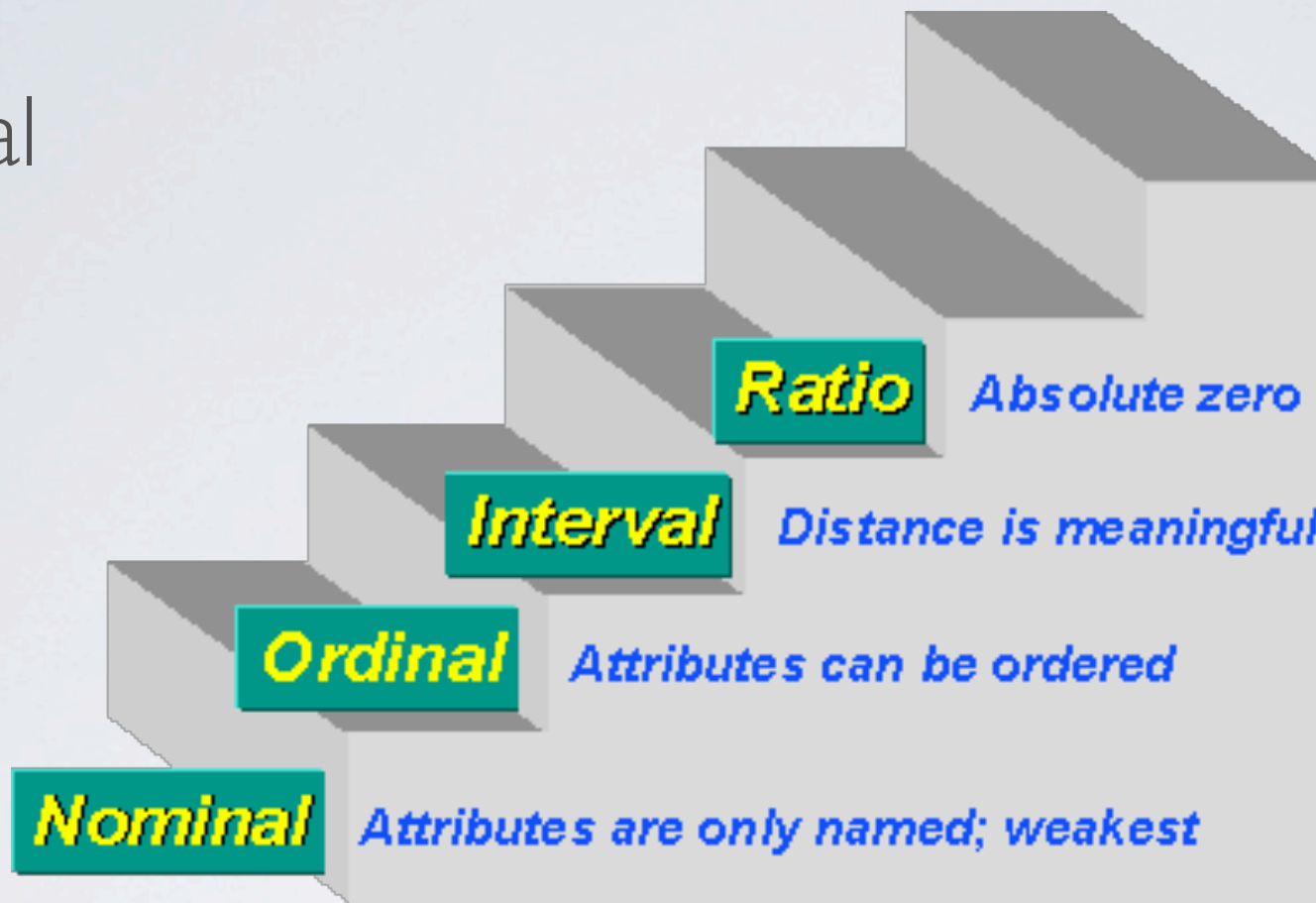
- Interval

- Ratio

- Measurement Error -  
Sources

- random

- systematic



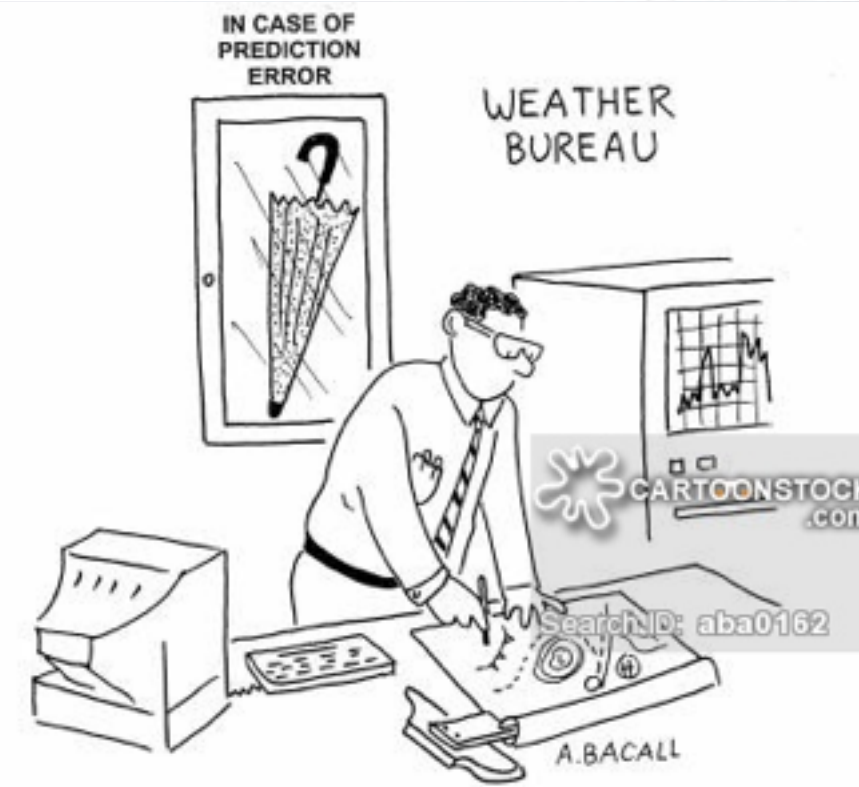
$$X = T + e$$

Two Components:

$e_r$  • Random Error

$e_s$  • Systematic Error

$$X = T + e_r + e_s$$

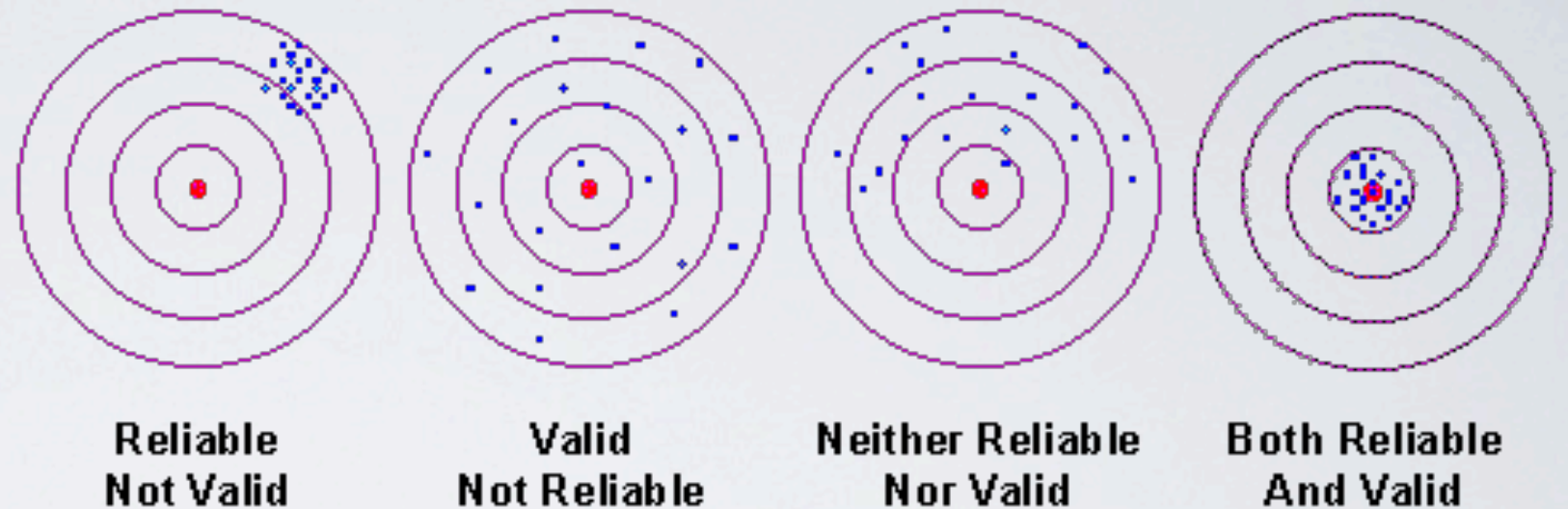




# VALIDITY/RELIABILITY

- Validity

- Face validity
- Criterion validity
- Construct validity



- Reliability

- Interrater
- Parallel forms
- Internal consistency



**WE BUY THINGS WE DON'T NEED  
WITH MONEY WE DON'T HAVE  
TO IMPRESS PEOPLE WE DON'T LIKE.**



# QUESTIONNAIRE CONSTRUCTION

- Asking questions
  - Relevant to study and to respondents
  - “Measurement” categories
- Pitfalls
  - Double barreled questions
  - Ambiguous wording
  - Level of wording
  - Abstract vs factual questions
  - Leading questions





# Q CONSTRUCTION CONT'D

- Sensitive or threatening questions
- Open ended versus close ended - coding problems
- Design
  - White space
  - Clean, clear layout
  - Length

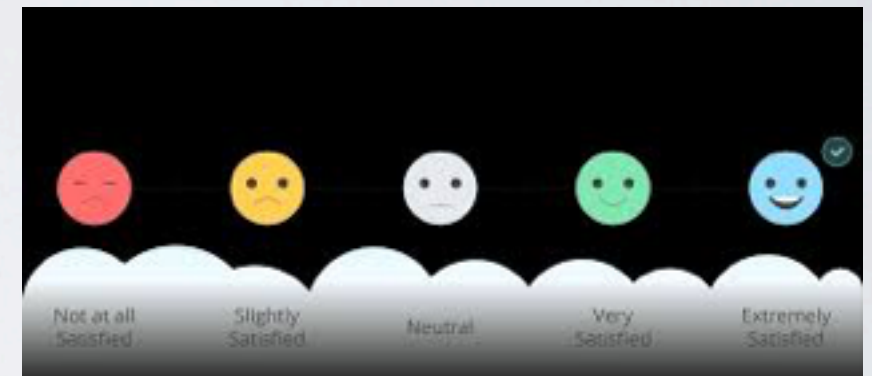




# SCALES

- Likert (5 vs 7 vs 9 points)
- Guttman (Bogardus Social Distance Scale)
- Thermometer (How +/- do you feel about)
- Presence - Absence
- Rank order
- Semantic differential
- Magnitude estimation
- Composite scales (sum vs mathematical functions as in per capita rates)

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)



Please rank the following from 1 to 5 according to their importance. 1 is most important.

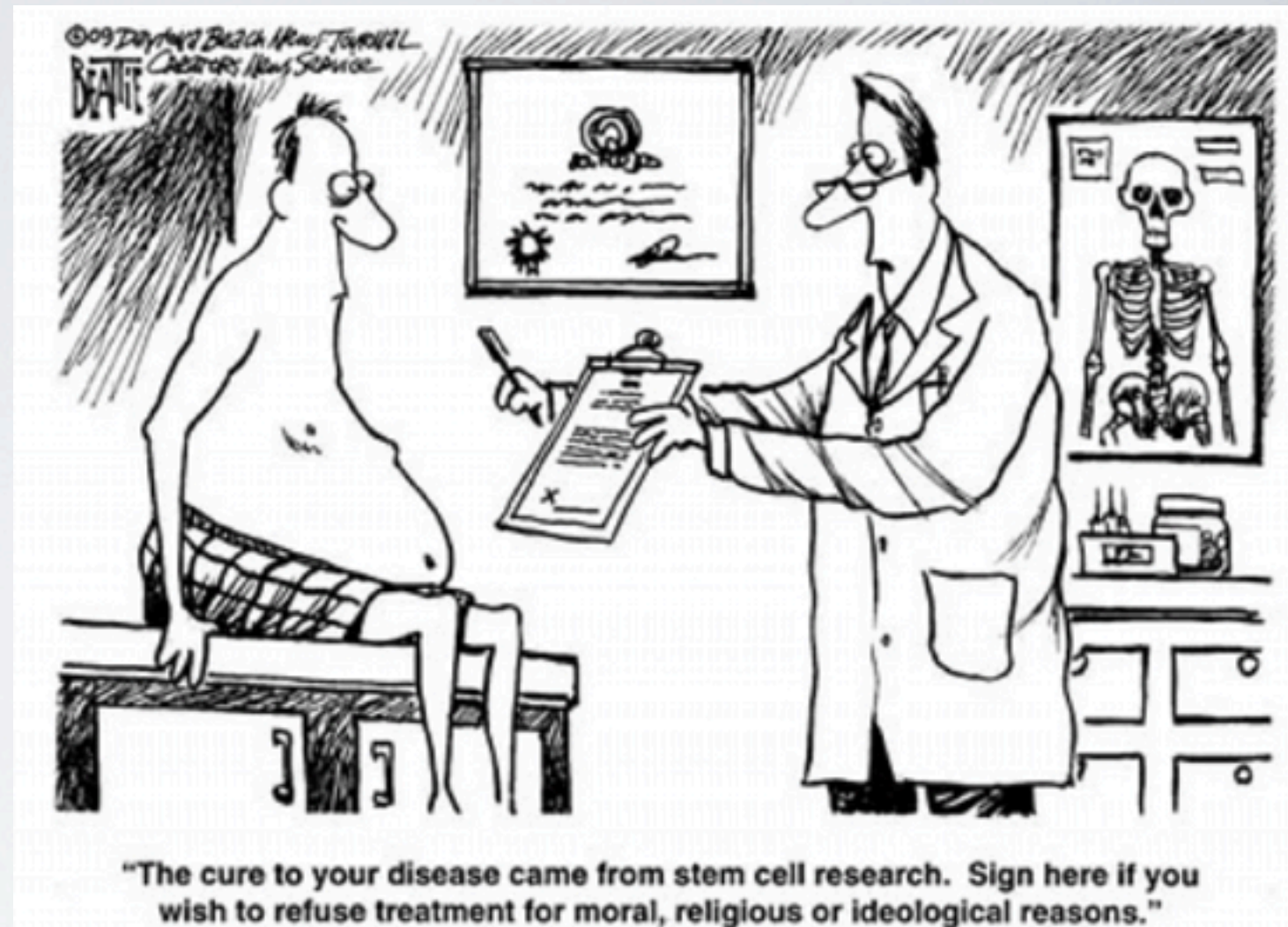
Price	<input type="text" value="2"/>
Comfort	<input type="text" value="1"/>
Ease of Use	<input type="text" value="3"/>
Stylish	<input type="text" value="5"/>
Durability	<input type="text" value="4"/>

[illegible]



# ETHICS IN SW RESEARCH

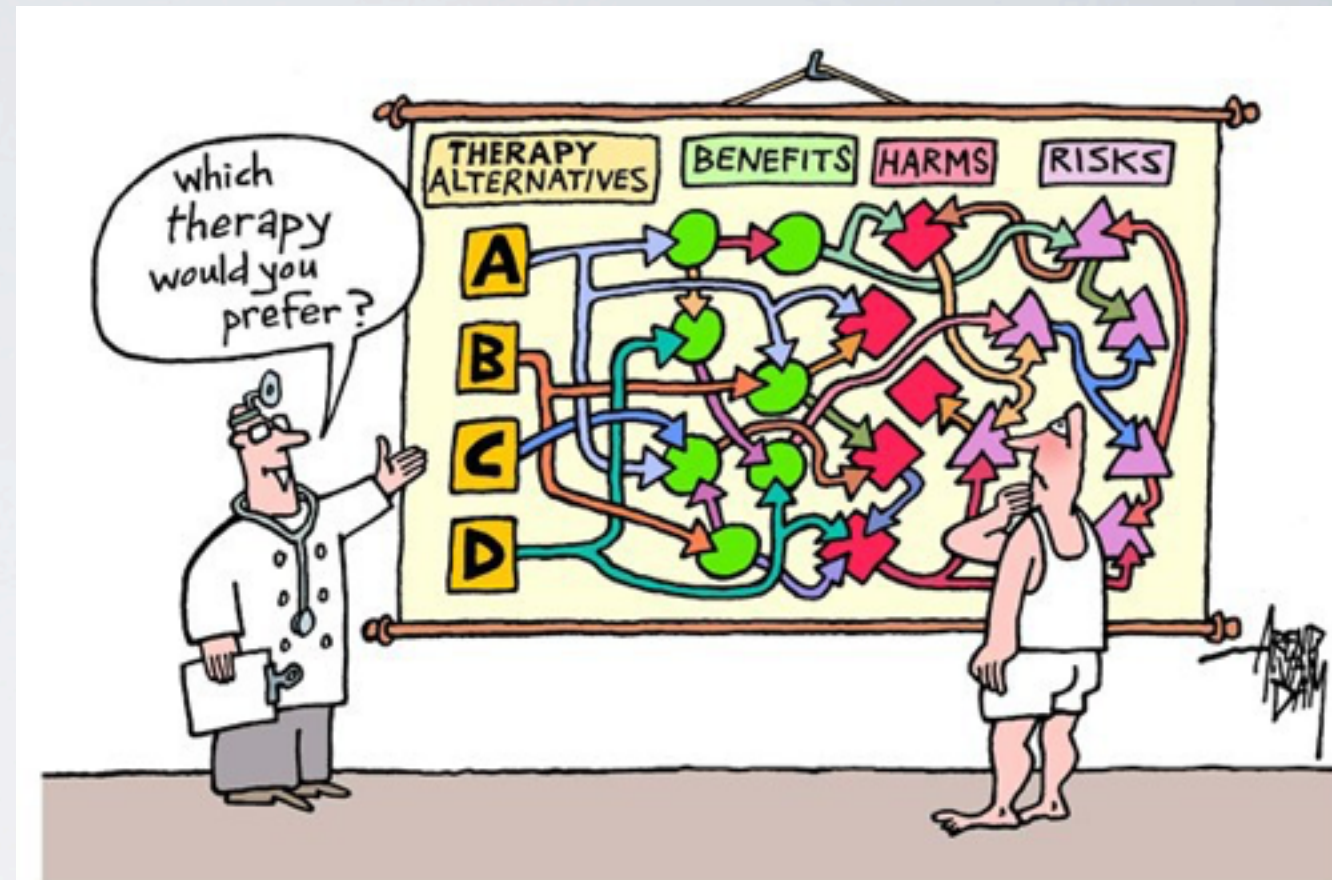
- Treatment of Subjects
  - Voluntary participation
  - Informed consent
  - No harm to participants
  - Anonymity
- Confidentiality
- Clear ID of sponsor
- Disclose basis on which respondent selected





# ETHICS IN SW RESEARCH

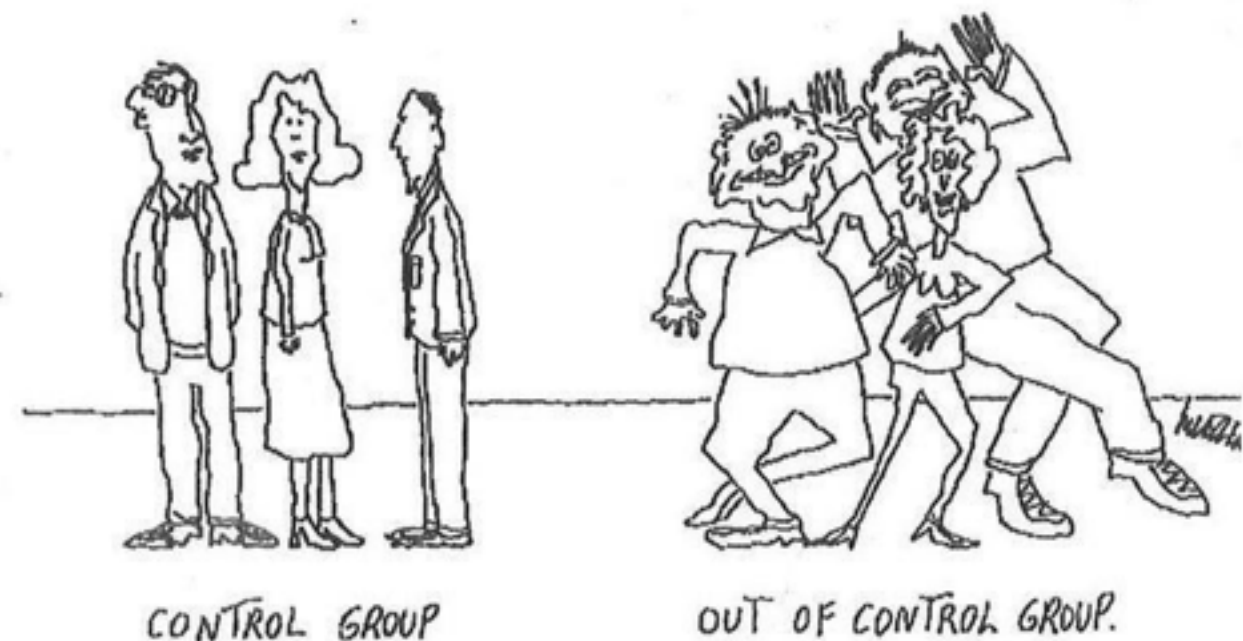
- No hidden ID codes or hidden agendas
- Where there is a promise, must honour
- Special issues: vulnerable populations
- Special issues: Right to receive service
- Ethics of Researcher
  - Do not set out to prove a point
  - Do not hunt for pleasing findings
  - Be aware of sources of bias
  - Represent scientific literature fairly
  - Acknowledge literature and human resources who helped





# RESEARCH DESIGN

- Pre-experimental Research Designs
  - One-Shot Case Study
    - Stimulus -> Post-test
  - One-Group Pretest-Post-test Design
    - Pretest -> Stimulus -> Post-test
  - Static Group Comparison





# RESEARCH DESIGN

- Experimental Research Designs - Randomization & Matching

- Classic Experimental Design

- A ○ - X - ○

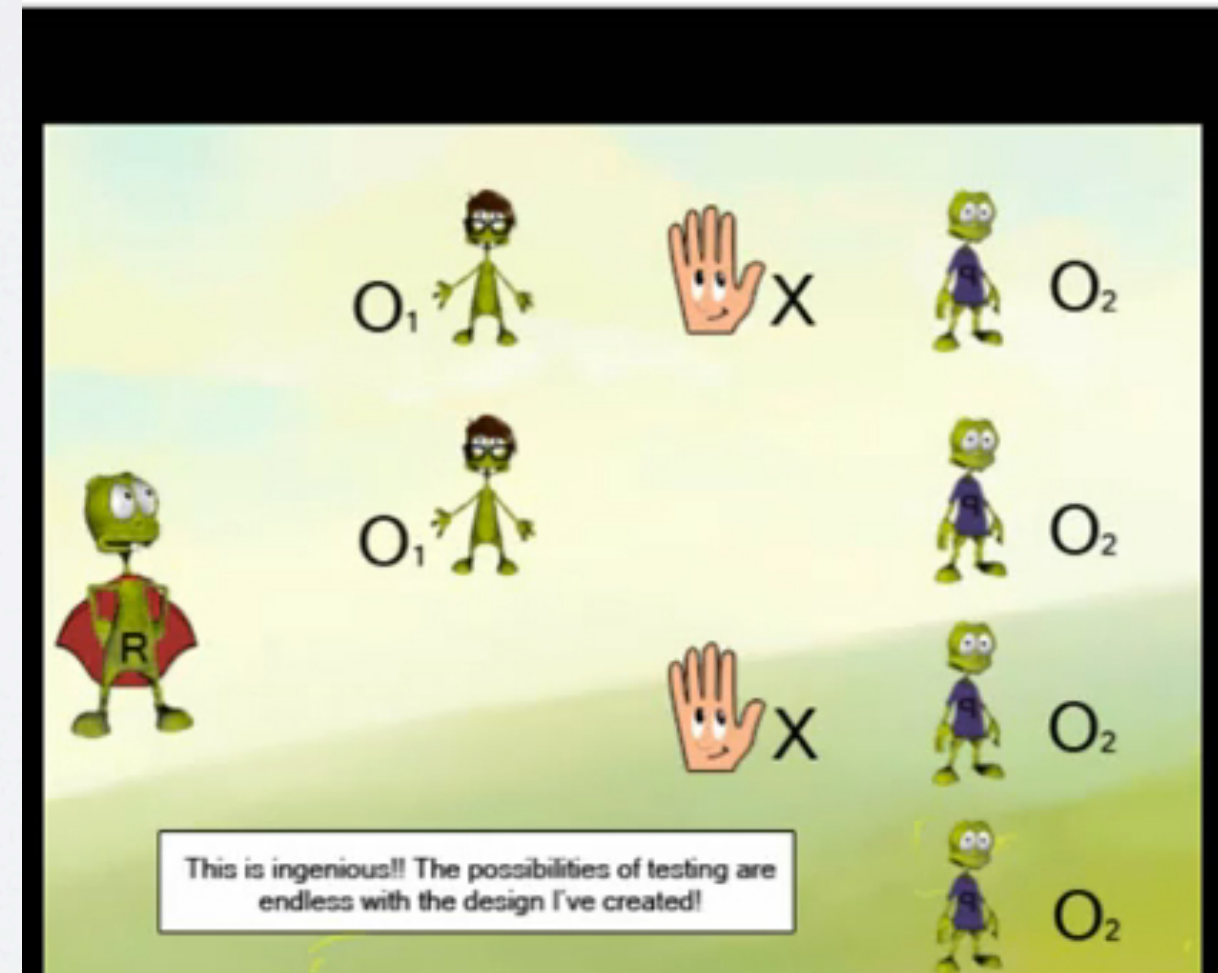
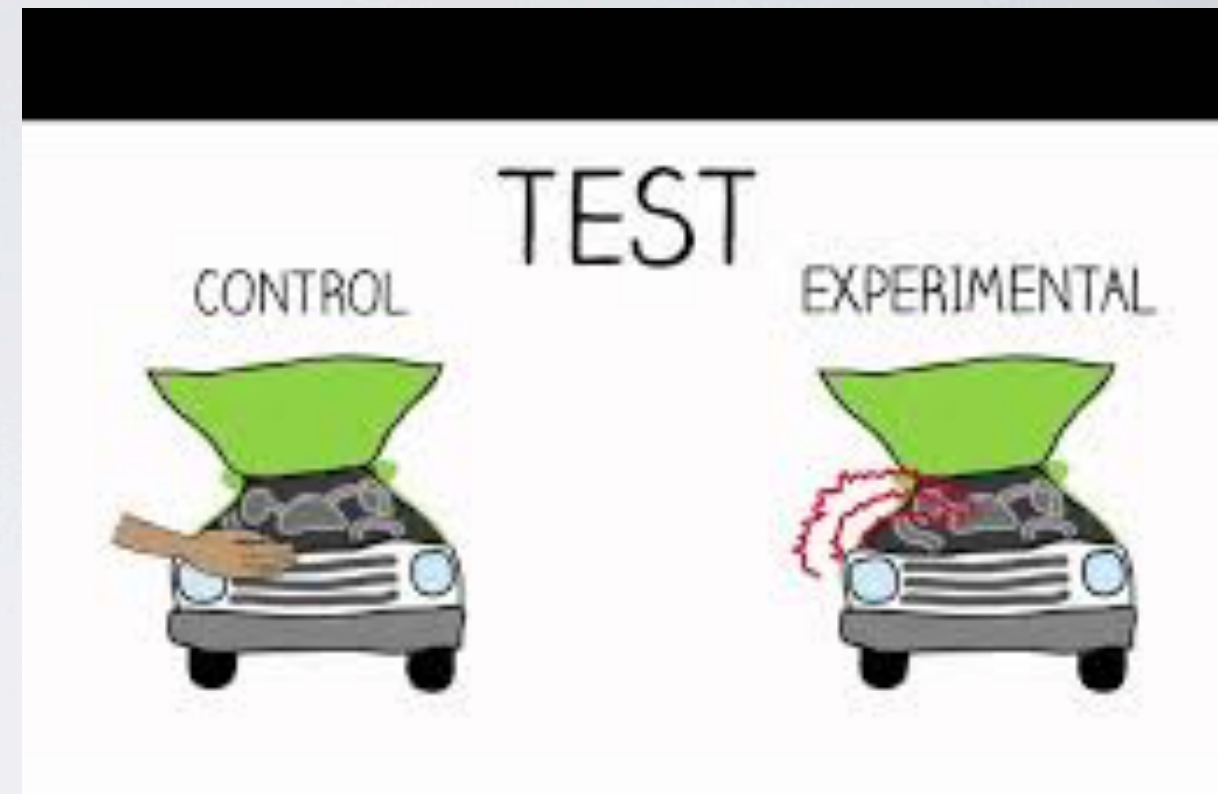
- B ○ - ○

- Posttest Only Control Group Design

- A X - ○

- B ○

- Solomon Four-Group Design



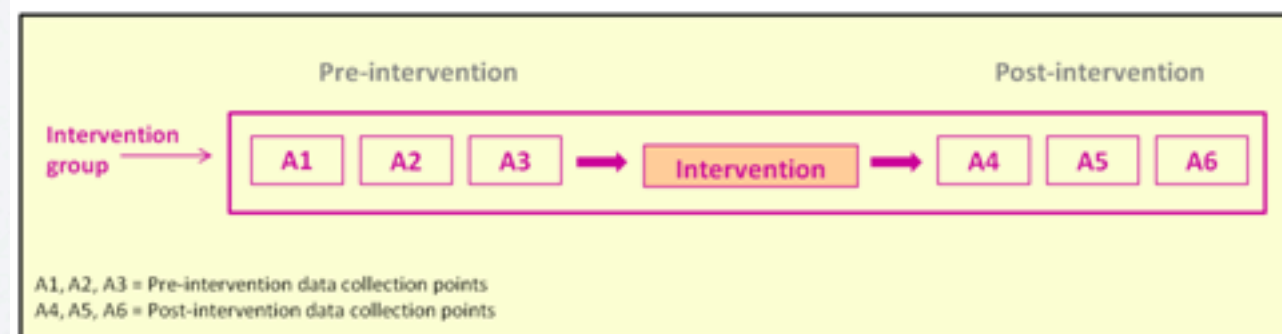


# RESEARCH DESIGN CONT'D

- Quasi-experimental Research Designs
  - Nonequivalent Control Groups Design
    - A    ○   -   X   -   ○
    - B    ○        -        ○
  - Simple Time Series Designs/Single Subject
  - Multiple Time Series Designs/Interrupted Time Series w/ Nonequivalent Control Group Time Series Design



## Non-Experimental Time Series Design





# SAMPLING

- Probability Sampling
  - Simple random
  - Systematic
  - Stratified
  - Cluster
- Nonprobability
  - Purposive / Judgemental
  - Quota
  - Convenience
  - Snowball

