

THE "ENEMIES" OF SCIENCE

• PERSONALLY I DON'T LIKE THE WORD
"ENEMIES"

HOWEVER FROM TIME-TO-TIME THE WHOLE

BASIS OF THE SCIENTIFIC VIEW OF THE
WORLD IS QUESTIONED

IF WE WANT TO UNDERSTAND HOW SCIENCE

WORKS — WHAT IT CAN TELL US ABOUT
REALITY

— MAY BE WHAT IT CANNOT
TELL US

— SHOULD UNDERSTAND THESE CRITICISMS
& WHY THEY ARE WRONG.

TYPICAL CRITICISMS - FROM GREECE UNTIL NOW

- DOUBT WHETHER THERE IS ANY SOLID REALITY "OUT THERE" FOR SCIENCE TO KNOW
- EVEN IF THERE IS AN OBJECTIVE REALITY WE CANNOT KNOW IT BECAUSE WE ARE TRAPPED IN!
 - EVOLUTIONARY DEVELOPED BRAINS
 - CULTURAL ENVIRONMENT
 - HISTORY
 - REACTIONARY EDUCATION

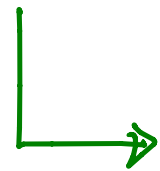
- LANGUAGE IS INCAPABLE OF COMMUNICATING ANY TRUTH ABOUT REALITY, SINCE WORDS CAN ONLY REFER TO OTHER WORDS — NOT REAL THINGS
- DOUBT LOGICAL NATURE OF RELATION OF EVIDENCE → CONCLUSION
 - GAP FILLED BY POLITICAL DECISIONS
- CONFUSE ETHICS WITH LOGICAL MISUSE OF SCIENTIFIC DISCOVERIES A REASON FOR DOUBTING THEIR OBJECTIVE REALITY

— PUTTING "POLITICS IN CHARGE"

THE CLAIM THAT SCIENCE ARRIVES

AT OBJECTIVE CONCLUSIONS IS:

AUTHORITARIAN & PATRIARCHAL



INTRINSICALLY DESERVING
OF OPPOSITION.

FOUR MODERN IRRATIONALS

LET'S LEAVE THE ANCIENT GREEKS OUT
OF THIS & LOOK AT THE PAST 80 YRS

POPPER } SURPRISE
KUHN }
LAKATOS } 1935-1980
FEYERABEND }

DIRECT ATTACK ON THE RELATION

EVIDENCE → CONCLUSION

KARL POPPER

VERY INFLUENTIAL — DOMINATED
THE LOGIC OF SCIENTIFIC DISCOVERY
PHILOSOPHY OF SCIENCE
IN THE 1960s

POPPER USUALLY CONSIDERED A DEFENDER
OF SCIENCE (AND DEMOCRACY

→ THE OPEN SOCIETY AND
ITS ENEMIES)

IF ASKED WHAT THE "SCIENTIFIC
METHOD" IS — MANY (MOST? ALL?)

SCIENTISTS QUOTE KARL POPPER

- POPPER ALSO BELIEVED THAT HE WAS A DEFENDER OF SCIENCE.
- HE HAD TWO BASIC CONVICTIONS
 - 1) SCIENCE MUST STICK IT'S NECK OUT & MAKE PREDICTIONS WHICH CAN BE FALSIFIED

MARX, FREUD (DARWIN?) HAD THEORIES WHICH "EXPLAINED" THE OBSERVATIONS THEY MADE

POPPER CLAIMS THAT THERE IS NO MERIT
IN A THEORY WHICH CAN "EXPLAIN" ANY
OBSERVATION → NEED FALSIFIABLE PREDICTIONS

YOU MAY HAVE HEARD MARXIST FRIENDS
"EXPLAINING" SOME FACET OF SOCIETY
OR HISTORY

"IT IS NO ACCIDENT THAT"

→ THIS IS IN SOME WAY CORRECT
FRANKLIN AGREES WITH THIS
(SORT OF)

- REMEMBER, FRANKLIN IS TRYING TO ESTABLISH A LOGICAL BASIS OF SCIENCE
- HIS CRITICISM OF POPPER IS THAT POPPER ACCEPTS HUME'S ARGUMENT THAT LOGICAL INDUCTIVE INFERENCE IS UNJUSTIFIED
 - THERE IS NO SUCH THING AS INDUCTIVE OR PROBABILISTIC LOGIC
 - POPPER TRIES TO MAKE DO WITH DEDUCTIVE LOGIC

TWO PROBLEMS WITH DEDUCTIVE

1) IN THE REAL WORLD HARDLY ANYTHING
IS LOGICALLY INCOMPATIBLE WITH
ANY THING ELSE

GENERALLY IN A CONFLICT BETWEEN
THEORY (PREDICTION) & OBSERVATION

THERE IS A CHOICE OF (SOMETIMES
FAR FETCHED) WAYS OF MAKING

THEM COMPATIBLE (IN THE THEORISTS'
MIND)

2) THE "FALSIFICATION" IDEA ALSO HAS PROBLEMS WITH COMPLEX STATEMENTS

"EVERY SPECIES DESCENDS FROM SOME PRE-EXISTING SPECIES"

THIS IS NOT FALSIFIABLE IN POPPER'S SENSE → NO FAILURE TO FIND AN ANCESTOR WILL FALSIFY THE STATEMENT THAT ONE EXISTS SOMEWHERE

- A CRUCIALLY IMPORTANT PROBLEM COMES FROM STATISTICAL NATURE OF MUCH OF MODERN SCIENCE

STATISTICAL NATURE OF SCIENCE

STATEMENTS LIKE:

"MOST SWANS ARE WHITE"

"99% OF SWANS ARE WHITE"

ARE NOT FALSIFIABLE

THEY ARE LOGICALLY COMPATIBLE

WITH ANY OBSERVED FREQUENCY

POPPER WAS AWARE OF THIS

SINCE FALSIFIABILITY DOES NOT WORK
IN A HARD LOGICAL SENSE, POPPER
SUGGESTS!

"ADOPT A METHODOLOGICAL RULE
TO REGARD A HIGH DEGREE OF
-VE CORROBORATION AS FALSIFICATION"

FRANKLIN:

$p \& q$ AR CONSISTENT IS REPLACED BY

LET US REGARD $p \& q$ AS INCONSISTENT

REPLACE LOGIC WITH SOCIOLOGICAL
ENTITIES SUCH AS "RULES"

A SECOND PROBLEM WITH POPPER

IF A THEORY SURVIVES FALSIFICATION DOES
IT BECOME ANY MORE CREDIBLE THAN BEFORE?

POPPER → NO

↳ DENIES PROBABILISTIC LOGIC

OBJECTIVE BAYESIANISM:

IF A THEORY MAKES PREDICTIONS WHICH
TURN OUT TO BE TRUE — THEN THE
THEORY BECOMES MORE PROBABLE

MORE FORMALLY:

- If $P(h/b)$ is Low & $h \notin b \Rightarrow e$
- WHILE $P(e / \text{not } h \notin b)$ is Low
- THEN $P(h / e \notin b)$ is MUCH LARGER THAN $P(h/b)$

IF HYPOTHESIS 'h' IS INITIALLY UNLIKELY ON THE BASIS OF EVIDENCE 'b'. THEN A CONSEQUENCE OF 'h' WHICH IS UNLIKELY WITHOUT 'h', INCREASES IT'S PROBABILITY

MOST SCIENTISTS THINK THAT POPPER
SHOWED THAT ONE CANNOT BE CERTAIN
ON THE BASIS OF ANY FINITE AMOUNT
OF EVIDENCE

THEY MISS HIS ACTUAL STATEMENT
THAT A SUCCESSFUL TEST DOES NOT
INCREASE OUR CONFIDENCE

ECCLES' & MEDAWAR QUOTES P.31

THOMAS KUHN

EXTREMELY INFLUENTIAL

IN THE ARTS & HUMANITIES CITATION INDEX

V.I. LENIN IS THE MOST CITED AUTHOR

BUT KUHN'S BOOK THE MOST CITED WORK

KUHN — STRUCTURE OF SCIENTIFIC REVOLUTION

JOYCE — ULYSSES

FRYE — ANATOMY OF CRITICISM

↑
U of T.

↑
AL GORE'S
FAVORITE
BOOK

(SAYS FRANKLIN)

KUAN SEEMS TO SAY THAT SCIENCE IS
NOT A CONTINUAL REVELATION OF
OBJECTIVE REALITY

→ SCIENCE IS ALL THEORETICAL TALK &
NEGOTIATIONS

cf GALILEO

" BUT IN NATURAL SCIENCES THESE
CONCLUSIONS ARE TRUE & NECESSARY
AND HAVE NOTHING TO DO WITH
HUMAN WILL "

UNTIL KUHN'S PHILOSOPHY OF SCIENCE CONCERNED

— HOW EVIDENCE CONFIRMS THEORIES

— WHAT IS THE DIFFERENCE BETWEEN
SCIENCE & PSEUDOSCIENCE?

KUHN SAID THAT SCIENCE IS DOMINATED
BY PARADIGM

MOST SCIENCE IS WHAT HE CALLS NORMAL
SCIENCE. SOLVING STANDARD PROBLEMS
WITHIN THE CURRENTLY REIGNING
PARADIGM.

• THIS NORMAL SCIENCE CHUGS ALONG HAPPILY. BUT ANOMALIES ACCUMULATE WHICH CANNOT BE EXPLAINED BY THE CURRENT PARADIGM.

• SCIENCE THEN ENTERS A REVOLUTIONARY PERIOD
OLD DEFENDERS OF THE PREVIOUS PARADIGM DIE OFF

ONE EXAMPLE (? FROM MEMORY)

IDEA OF MOTION

BODIES TRY TO RETURN TO CENTER OF EARTH

—ARISTOTLE

UNIFORM MOTION UNLESS ACTED UPON

BY A FORCE — GALILEO → NEWTON

EXAMPLE OF INFLUENCE

— "END OF HISTORY" FRANCIS FUKUYAMA

"THE CUMMULATIVE & PROGRESSIVE
NATURE OF MODERN SCIENCE HAS
BEEN CHALLENGED -----

----- KUHN HAS DENIED THE
POSSIBILITY OF "SCIENTIFIC" KNOWLEDGE

— ALL PARADIGMS ULTIMATELY FAIL"

KUHN'S IDEAS ALLOW PEOPLE TO IGNORE
CUMMULATIVE PROGRESS IN SCIENCE

SCIENCE IS ABOUT ARGUING ABOUT THEORY
NOT ACCUMULATING EVIDENCE

FRANKLIN'S CRITIQUE OF KUHN

- WHAT DOES UNSUSTAINABILITY OF A PARADIGM ACTUALLY MEAN?
- IS IT A MATTER OF LOGIC OR PSYCHOLOGY?
- IF IT JUST MEANS THAT THERE ARE OBSERVATIONS WHICH WOULD BE UNLIKELY IF THE THEORY WERE TRUE
WELL THAT'S WHAT WE HAVE THOUGHT
SCIENCE IS ABOUT FOR A LONG TIME

IN FACT I BELIEVE THAT KUHM MAKES
THE POINT THAT OLD & NEW PARADIGMS
ARE INCOMMENSURABLE

IT SEEMS TO ME, THAT, AT LEAST SINCE
GALILEO SCIENCE HAS MADE STEADY
ALMOST EVOLUTIONARY PROGRESS

FARADAY'S EXPERIMENTS → MAXWELL'S
EQUATIONS → PRINCIPLE OF EQUIVALENCE → RELATIVITY
NEWTON MECHANICS → HAMILTONIAN MECHANICS
→ HAMILTON-JACOBI EQUATION
→ QUANTUM MECHANICS

FEYER ABEND → AGAINST METHOD

- THERE IS NO SCIENTIFIC METHOD ANYTHING GOES
- NO METHODOLOGICAL RULES GOVERNING THE PROGRESS OF SCIENCE.
- NO SINGLE METHOD WHICH CAN ACCOUNT FOR PROGRESS OF SCIENCE.
- ANY SUCH METHOD WOULD LIMIT SCIENCE.
- EPISTEMOLOGICAL ANARCHISM
- CRITICAL OF FALSIFIABILITY → NO THEORY IS EVER CONSISTENT WITH ALL RELEVANT FACTS.

FEYERABEND

- NEW THEORIES DO NOT HAVE TO BE
CONSISTENT WITH OLD THEORIES

IMRE LAKATOS → WILL MENTION HIM
IN DISCUSSION OF
SCIENCE
&
PSEUDO SCIENCE.

POSTMODERNISM

NEXT WEEK

→ THEN ONTO DISCUSSIONS

ABOUT HOW SCIENCE WORKS

POST MODERNISM

- I'VE ALWAYS WANTED TO UNDERSTAND WHAT **POSTMODERNISM** IS ABOUT.
- I HAVE THE IMPRESSION THAT IT IS (OR WAS) A VERY INFLUENTIAL WAY OF THINKING IN THE HUMANITIES.
A WIDELY ACCEPTED CRITIQUE OF SCIENCE — OUTSIDE OF SCIENCE

A RANDOM SCIENTIST:

AREN'T THE CLAIMS OF SCIENCE JUST TRUE?

— SOME THINGS ARE JUST OBJECTIVELY
TRUE OR UNTRUE → SCIENCE FIGURES
THAT OUT — DR. POPPER TOLD ME

POST MODERNIST:

THINGS ARE ALWAYS DOUBTFUL, OR THEY
ARE STATED RELATIVE TO OUR PARADIGMS.
OR THEY ARE JUST TRUE FOR THE DOMINANT
GROUPS IN SOCIETY — AND ANYWAY IN WHOSE
INTEREST IS IT TO THINK THAT SCIENCE
IS TRUE?

SEMIOTICS

FERDINAND de SAUSSURE — SWISS LINGUIST

SEMIOTICS IS THE STUDY OF SIGNS AND
THE PROCESS OF SIGNING (SEMIOSIS)

- SEMIOTICS IS CLOSELY RELATED TO LINGUISTICS
 - ↳ STUDIES NON-LINGUISTIC SIGN SYSTEMS
- THE POST MODERNIST CRITIQUE OF SCIENCE IS BASED ON AN ARGUMENT ABOUT WHAT LANGUAGE ACTUALLY REFERS TO.

3 BRANCHES OF SEMIOTICS!

SEMANTICS RELATION BETWEEN SIGNS &
THE THINGS THEY REFER TO

SYNTACTICS RELATIONS AMONG SIGNS
IN FORMAL STRUCTURES

PRAGMATICS RELATION BETWEEN SIGNS
AND SIGN USING AGENTS

- SAUSSURE — LANGUAGE CANNOT REFER TO REALITY ONLY TO OTHER LANGUAGE
- LANGUAGE IS CUT OFF FROM REALITY
- THE MEANING OF WORDS COMES FROM DIFFERENCES FROM OTHER WORDS — NOT FROM A DESCRIPTION OF REALITY
- "BLACK" GETS ITS MEANING SOLELY AS THE OPPOSITE OF "WHITE" RATHER THAN A DESCRIPTOR OF BLACK THINGS

THIS POSTMODERN CRITIQUE IS ACTUALLY
QUITE ANCIENT

GREEK NIHILIST PHILOSOPHER GORGIAS

1) NOTHING EXISTS

2) EVEN IF SOMETHING DOES EXIST
IT IS INAPPREHENSIBLE BY HUMANS

3) EVEN IF EXISTENCE IS APPREHENSIBLE
IT CANNOT BE COMMUNICATED
TO OTHERS

FRANKLIN IS VERY DISPARAGING
OF POST MODERNISM AND ITS CONCENTRATION
ON STRUCTURE OF LANGUAGE RATHER THAN ITS
ABILITY TO REFER TO SOMETHING OUTSIDE
OF ITSELF

MY RESPONSE TO POST MODERNISM WOULD
BE "DARWINIAN"

LANGUAGE EVOLVED DUE TO PRESSURES
OF THE REAL WORLD THERE FOR
IT REFERS TO THE REAL WORLD

THE SOKAL HOAX

THIS WAS A CONTROLLED EXPERIMENT ON
WHETHER ONE CAN DISTINGUISH POST MODERN
WRITING FROM DELIBERATE NONSENSE

ALAN SOKAL — PHYSICIST — NEW YORK
UNIVERSITY

SUBMITTED TO "SOCIAL TEXT" JOURNAL

"TRANSGRESSING THE BOUNDARIES: TOWARD
A TRANSFORMATIVE HERMENEUTICS OF
QUANTUM GRAVITY"

DELIBERATE MEANINGLESS SPOOF

PUBLISHED

THE SOKAL HOAX — AN ATTEMPT TO DISCREDIT

— THE "SOCIAL CONSTRUCTION OF SCIENCE"

— NO OBJECTIVE REALITY

LOGIC REPLACED BY SOCIOLOGICAL CONSIDERATIONS

— SCIENCE DONE BY HUMANS

↳ ONLY ACTED ON BY SOCIOLOGICAL
CONSIDERATIONS

↳ NOT ACTED ON
BY ABSTRACT FACTS

BOOK BY SOKAL!~

INTELLECTUAL IMPOSTURES: POST
MODERN PHILOSOPHERS' ABUSE OF
SCIENCE

I MAY READ IT WHEN

I HAVE SOME SPARE TIME.

JPH 441 Y - THE STORY SO FAR

- SCIENCE PROCEEDS BY
 - INDUCTION / BAYESIAN OBJECTIVITY
 - EXPERIMENT / OBSERVATION DECREASES OR INCREASES OUR CONFIDENCE IN A THEORY
- SCIENCE IS A LOGICAL, OBJECTIVE INVESTIGATION OF AN OBJECTIVE REALITY.

